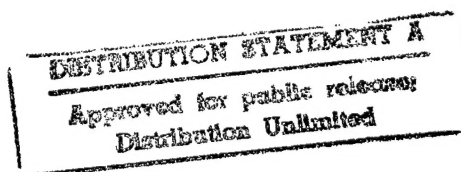


# ***JPRS Report***

# **Science & Technology**

***USSR: Life Sciences***



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# Science & Technology

## USSR: Life Sciences

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**Hygiene Assessment of Electrolysis Oxygen  
Produced From Water of Varying Chemical  
Composition**

917C0452 Moscow GIGIYENA I SANITARIYA  
in Russian No 1, Jan 91 (manuscript received 5 Dec 88)  
pp 32-33

[Article by I. P. Kozyarin, V. G. Suk, A. A. Maslenko, Ye.  
N. Kolomiyets, I. M. Khomenko, and G. M. Shmuter,  
Kiev Medical Institute]

UDC 613.155:574685]:[546.21:543.25]:612.014.464

[Abstract] Owing to the obvious importance of the composition of the air breathed by cosmonauts, divers, and submariners when confined to sealed spaces, the

researchers performed a toxicological/hygiene evaluation of electrolysis oxygen produced in a system with a solid polymer electrolyte from water containing various chemical substances of organic and inorganic origin. The research was done with two groups of guinea pigs who breathed a mixture of electrolysis oxygen and nitrogen in a 1:4 ratio for 30 days. No changes were observed in the general condition, appearance, or behavior of the animals over the course of the experiment. Body weight changes in the experimental animals were similar to those in control, as was the case for most of the 25 indices under scrutiny. The researchers concluded that the oxygen/nitrogen mixture breathed by the guinea pigs produced no negative effects and can be used for the artificial atmospheres created in sealed spaces. References 7: Russian.



### The Condition and Avenues for the Conservation of Lake Issyk-Kul

917C0628A Frunze IZVESTIYA AKADEMII NAUK KIRGIZKOY SSR: KHIMIKO-TEKHNOLOGICHESKIYE I BIOLOGICHESKIYE NAUKI, in Russian No 3, Mar 90 pp 3-11

[Article by A. M. Mamytov; Commission on Ecological Problems, Academy of Sciences of the Kirghiz SSR]

UDC 556.555.8:502.7 (282.255.6) (04)

[Text]

#### I. The Contemporary Condition and Functioning of the Lake Issyk-Kul Ecosystem

The high-mountain Lake Issyk-Kul and the basin of the same name have long attracted the attention of the scientific public and wide circles of the general community, both in our country and beyond its borders. The unfortunate ecological situation has led to the necessity of creating the Issyk-Kul Scientific Research Center of the Academy of Sciences [AN] of the Kirghiz SSR, as well as to the organization of the "Committee for the Defense of Issyk-Kul." UNESCO and other public scientific organizations which have recognized the exceptional significance of the ecosystem of the lake for rare species of waterfowl, have turned their attention to the range of problems of Issyk-Kul; the coastal aquatic-marshy milieu has received special international status as a habitat of valuable representatives of aquatic fauna. The lake became known to the entire world following the Issyk-Kul Forum organized on the initiative of Chingiz Aytmatov.

The regional geographic peculiarities of the Issyk-Kul natural complex, which are associated with its mountainous fastness, its high-mountain hypsometric location, and the internal drainage of the body of water have determined the rare and unique combination of natural components, a paradoxical geographic phenomenon, differing sharply from the aspect of other arid zone lakes.

The total mineralization of the lake water is within the limits of about 6.0 g/l (almost 5.5 times less than the average salinity of the world ocean), and is characterized by a high content of dissolved oxygen and an exceptional transparency. The latter is simply astonishing: schools of fish in various places are visible at a depth of several tens of meters, and green aquatic plants grown at a depth down to a hundred meters, because of the depth of penetration of the sun's rays. It is hard to find another, so exceptional body of water anywhere in the world.

The water of the lake possesses healing properties due to the content of ions of various salts. In addition, the shorelines of the lake are rich in thermal mineral waters similar to the waters of the well-known Staraya Russa, Palanga, and Soligorsk spas, which have valuable balneological properties. Marvelous sandy beaches, stretching more than 300 km, girdle the lake.

There are also a multiplicity of ecosystems in the Lake Issyk-Kul basin which are not encountered in other mountain regions. These are the deserts of the western Issyk-Kul region, syrts, perpetual glaciers and snows, high-mountain deserts, juniper and spruce forests. Here one may encounter desert, semidesert, steppe, forest-meadow, sub-alpine, alpine, and tundra-like terrains; about 4,000 species of plants and animals live and thrive here, including many endemic species.

There are no lakes to equal this one; it is one of the miracles of the planet, an object of pride and a national treasure, a symbol of the Kirghiz people, and in this sense is not only a natural-ecological, but a cultural-historical jewel as well.

Our "pearl" has no analogs in its uniqueness, and in its vulnerability, since the latter is associated with the internal drainage of its basin, and with the limited ecological resistance of the intrinsic natural complexes of the basin. The basin of Lake Issyk-Kul, in the very complex of its natural factors, is a unique recreational system and natural laboratory, in which living and inanimate nature interact, forming the corresponding biogical and relict natural objects.

Are we doing everything to preserve this natural marvel for future generations? It seems we are not.

The intensive and unsparing exploitation of the richest resources of the Issyk-Kul region are already reflected in the condition of the unique nature of this region: there is non-correspondence between the anthropogenic burden and the bioresource potential of the region. Serious deficiencies in the planning and the development of agriculture, of the processing industry, transport, and health improvement institutions, and the increase in the population due to migration have exerted an acutely negative influence on the ecosystem of Lake Issyk-Kul. The destruction of the most valuable areas of picturesque landscapes (the degradation of remarkable sites, the annihilation of mountain forests and of stands of sea buckthorn, barberry, etc.) is taking place; some species of biota are being eliminated; the pollution of the body of water is progressing and the sanitary state of the shoreline is deteriorating; the splendid beaches and healing muds are being lost. All of this is the result of the intensive utilization of natural riches without sufficient scientific substantiation; of the use of mineral fertilizers, herbicides, and toxic chemicals; the irrational placement of cattle-raising facilities near the lake; the lack of or low efficiency of the operation of purification equipment; the violation of the practices of transport operation, of the storage of petroleum products, mineral fertilizers, and of agents for the chemical protection of plants; and as the result of the violation of the regulations on environmental conservation by agricultural, industrial, and transport, and sometimes health improvement enterprises. The principal cause of the vulnerability of Lake Issyk-Kul is not ecological, but socioeconomic, above all social, mismanagement.

## II. Avenues for the Conservation of Lake Issyk-Kul

1. With the aim of improving the health of the ecological situation in the region, it is necessary to pass a law regarding the conservation of Lake Issyk-Kul and its mountainous setting.

2. It is advisable to radically change the structure of the economy of the Issyk-Kul basin, to shift to an ecological-economic system of management, and to determine the ecologically acceptable limits of economic activity. Accordingly, it is necessary to develop norms of payment for the use of water, land, biological, spa-recreational, and other natural resources, and to work out an economic mechanism which will stimulate the rational utilization of natural resources in the basin of Lake Issyk-Kul.

The regional planning project of the Issyk-Kul spa region, which was ratified by resolution No. 519 of 10 October 1975 of the Council of Ministers of the Kirghiz SSR, is not being carried out effectively.

It is necessary to review the general plan of spa utilization and recreation of the Lake Issyk-Kul basin. The anticipated increase in the contingent of vacationers up to 1.5 million by 2005 will place an extreme burden on the Issyk-Kul region geocomplex. Therefore, the entire biocenological situation of the Lake Issyk-Kul basin may be disrupted, which will induce unpredictable consequences for nature and man. By that time the population of the basin, at an average annual growth of 1.3 percent, will reach about 400,000 individuals. It is necessary in this connection to determine the optimal and maximum permissible recreational capacities of the coastal zone of Lake Issyk-Kul. A model of land use measures for the Issyk-Kul basin must be worked out again, taking the requirements for the conservation of the environment and for the development of spa and health improvement establishments into account, and the prospects for the reorientation of agricultural production must be re-determined. In addition to a substantial change in the forms of management and organization of production, it is necessary to provide, in the complex of measures, for the improvement of the zone's food supply, for a sharp increase in the technological level of the agricultural products processing and storage base. Losses in this sphere are 30-40 percent. A quick way out would be the creation of joint enterprises primarily of small and medium-sized enterprises with foreign firms.

It is necessary to scientifically substantiate the further development of tourism as an important source for the strengthening of the economy by replenishment of the budget, especially with foreign currency. It is also necessary to expand cost-accounting based touristic-excursion enterprises, and to permit on the basis of their applications the use of guest houses and of a vacation center on the shores of Lake Issyk-Kul for the reception and servicing of tourists. And, it is necessary, with the agreement of the epidemiological station to practice more widely the utilization of yurt cities in order to attract tourists.

Public opinion must be taken into account in the solution of problems associated with the location of new enterprises and health improvement facilities and with the ecology of Lake Issyk-Kul.

3. The designing of the construction of sanitary-spa facilities in the shoreline zone must be re-examined, with partial transfer of it to the piedmont zone, and a strict sanitary regimen must be observed. The development of communication between the piedmont zone and the built-up shoreline zone by means of cable tramways would permit a reduction of the burden on land transport, although naturally the therapeutic influence of the sea air on the human organism is reduced a little. It is advisable to provide for measures to regulate seasonal population in accordance with the ecological and recreational capacity to assure the natural renewal of flora and fauna.

4. To radically improve the condition of the atmospheric basin of Lake Issyk-Kul. The accomplishment of heat supply to the spa zone through the use of electrical energy, as well as the use of nontraditional energy sources (solar, wind, geothermal), the limitation of travel to Lake Issyk-Kul during the spa season, and the introduction of payment for passage at a level which will restrain the flow of vehicular traffic would promote a reduction in emissions of harmful substances and the preservation of the purity of the atmospheric basin. The introduction of no-waste technology using closed cycles and complete cleansing of discharges, and the accomplishment of measures to decontaminate emissions by means of transportation, using for these purposes modern filtration adapters, adsorption and absorption purification, as well as the neutralization of exhaust gases have become urgent. Trolley bus traffic would be most ecologically sound of all on the stretch between the cities of Issyk-Kul and Cholpon-Ata. In ecological terms the continued functioning of the Przhnevsk Thermal Power Station, of the Kadzhi-Say electrotechnical and other plants of the construction industry evokes alarm. The further pollution of the environment and of the atmospheric basin by the Kurmenty Cement Factory is impermissible. Such particle and gas trapping installations which would maximally prevent harmful discharges must be used. Explosive operations in the quarry are a source of particulate pollution. The development of deposits by explosives with massive crumbling of rocks is impermissible from the ecological point of view.

5. It is necessary to remove petroleum bases, meat combines, mineral fertilizer warehouses, toxic chemicals, and chemical agents for the protection of plants and animals, as well as livestock installations located not only along the shore and close to the lake, but also along rivers emptying into the lake, for the purpose of reducing discharges of polluted and runoff waters into reservoirs and into Lake Issyk-Kul. It is also necessary to orient ourselves to the construction, as is the accepted practice abroad, of small, high-technology meat-processing enterprises with refrigeration facilities and slaughterhouses in direct proximity to the sites of production.

It is necessary to change attitudes toward the delivery, storage, and utilization of both mineral fertilizers and

toxic chemicals. In view of the fact that the use of mineral fertilizers and chemical agents for the protection of the plants is becoming a serious geophysical factor, priority must be given to organic fertilizers, to the tillage of green manure crops, and to other biological techniques for the enrichment of soils by organic matter. Great care must be observed in the planting of crops in the coastal region of Lake Issyk-Kul. A number of farms are located too close to the lake, and are subjected to chemical treatment repeatedly in the course of the growing season, thus becoming a source of pollution of the lake. The creation of fruit and berry plantings outside of the shoreline zone of Lake Issyk-Kul is ecologically preferable. It is necessary to shift to biological methods of combating diseases and pests in gardens when gardens are treated in the Issyk-Kul region. A protective buffer strip of sea buckthorn, barberry and other decorative shrubs and lawn grasses should be created in the shoreline zone of the lake.

6. A complex of measures for the stabilization of the level and purity of the waters of Lake Issyk-Kul should be accomplished; Lake Issyk-Kul should be replenished through the transmission of the runoff of the Karkyra River and the effluent waters of the Orto-Tokoy reservoir. The construction of the canal along the Karkyra River should be completed and the development of documentation with regard to Orto-Tokoy should be commenced, although the transmission of effluent waters of the latter requires a careful and balanced approach.

The expansion of the areas of irrigated lands in the lake basin must be limited, and the reconstruction of the irrigation systems and the increase of their efficiency through the wide application of advanced methods of irrigation must be carried out.

It is time to change attitudes toward underground waters. The decrease in the level of the lake today is caused in many respects by their mismanaged utilization. A procedure for the utilization of underground waters for irrigation and other economic purposes is necessary.

7. Special attention must be paid to the use of mineral resources. The attitude towards these must be based on the interests of the further development of the spa zone, on a strategy for utilization of natural resources and the conservation of mineral resources, as well as on the stabilization of population size of the region. Special attention must be devoted to exogenous processes, such as mudflow, mudflow streams, landslides, erosion, etc., which inflict direct harm, and, without the resolution of which the problems of the utilization of the natural resources of Issyk-Kul are impossible.

8. It is necessary to assure the efficient utilization of lands, and an increase in the fertility of soils through the realization of environmental technologies for the purpose of the stabilization of the ecological situation and for the conservation of exploitable land areas. Measures must be carried out for the preservation of the ecological functions of the soil cover to increase the productivity of natural and agrosystems.

Regional models and projects for the protection of soils from erosions must be developed. Equipment for cultivation, which excludes erosional processes, must be more widely introduced: the strip placement of crops, furrow irrigation, grasslands crop rotation, subsurface cultivation (in particular, subsurface fall plowing) as a principal technique in the cultivation of soil for the destruction of weeds.

The protection of the gene pool of the plant and animal world, especially of rare and disappearing species of flora and fauna, must be assured in order to achieve the ecological-genetic and evolutionary foundations for the preservation and utilization of biological resources. The regulations and rules of the International Convention regarding the exploitable aquatic-marshy areas of Lake Issyk-Kul, which serve as the habitat for waterfowl, must be strictly carried out.

The number of specially protected natural territories (natural model areas) must be increased in the future, and their areas expanded, so that they make up 5-6 percent of the total area of the basin. A national park must be organized, based on the Dzhety-Oguz forestry sector, and the Karakol, Teploklyuchenka, and Przhevalsk state forestry stations, which are in the middle portion of the Terskey-Alatau mountain range, where the forest belt is clearly distinguished, and where stands of spruce are most productive, for the maintenance and restoration of biogeocenoses. Natural resource management or bioecological monitoring must be organized for the observation and assessment of the environment on its territory. Model areas of the predominant types of vegetation must be planted; and the predominant types of fauna must be established for the study of the structural-functional characteristics of the biogeocenoses, and for the preservation of the stock of cenoses and the gene pool of the mountain species. A reserve should be organized in the central portion of the Terskey-Alatau mountain range, between the Tosor and Barskaun rivers, in which quite large forest areas, untouched by foresters, have been preserved, and vertical strips, starting from the arid steppes to the tundra phytocenoses, are more dramatically expressed.

Increases in the numbers of principal species of game animals should be achieved, the complete equipping of hunting areas should be carried out, and foreign hunting tourism should be organized on the hunting establishment territory.

A strict regimen must be developed for fishing in order to preserve and restore the fish productivity of the lake. The catching of all species of fish in the spawning period, with the exception of the pike perch, by any fishing equipment whatever, must be prohibited. The enterprise must be carried out in strict accordance with the scientifically substantiated limit and mode of fishing. Measures must be undertaken for the elimination of the pike perch and the trout as predators. Sport and amateur fishing from boats ought to be limited.

The cutting of spruce and lowland forests and of lakeside forest and shrub stands must be reduced. Green recreation zones should be created and the areas of spa forests



increased, taking due account of their decorative phytocidic character. The restoration of old, thinned-out spruce stands must be carried out, i. e., measures must be developed for the restoration of spruce forests on the ancient territories on which it flourished. The volume of forest restoration efforts must be expanded. The grazing of cattle on the territory of mountain forests which play a water conservation and soil protective role must be decreased everywhere, since the damage from floods and mudflows far exceeds the earnings from the rearing of livestock.

Bearing in mind the crisis condition of the plant and soil cover on pasture lands due to the extreme overpasturing of cattle, it is advisable to reduce the sheep stock to a level at which completely adequate feeding of the animals is possible, and to introduce pasture rotation everywhere in order to preserve and restore the biological productivity of plant communities. Sheep raising should be shifted from the extensive to the intensive approach to maintenance. The structure of the flock should be reviewed, bringing the ewe stock up to 55-60 percent, and in the future, to 70-80 percent.

The organization on pastures of short-term sheep stations (refuges) should be introduced, and the provision of rest to the pastures as well.

The practice of early grazing in spring and summer pastures should be decreased. The driving of cattle to high-mountain pastures prior to the passage of plants through the first stage of vegetation and prior to the consolidation of the sod cover for the prevention of erosion and of a sharp fall in productivity as well as in the food value of the pastures, should be considered impermissible and ecologically illiterate.

It is necessary to create purposefully variable natural cenoses on territories in which the natural vegetation is markedly degraded. On lands on which the herbage is almost entirely destroyed, agrophytocenoses must be created, and such cultivated phytocenoses should be laid in for hay.

10. A model of territorial anthropoecological system which will assure prolonged ecological equilibrium should be developed in the field of human ecology. The intrinsic natural processes should be analyzed in their immediate connection with the processes of social activity, taking due account of the fact that their involvement in the sphere of human activity may be indirectly, though substantially, destructive of the ecological equilibrium.

11. An integral ecological model of the Lake Issyk-Kul basin (a mathematical model which ties together in a unitary fashion natural and anthropogenic processes) should be created, in the process of the construction and functioning of which it will be possible to work out forecasts and the controlling influences which will be called upon to optimize the parameters of the unified Issyk-Kul anthropoecological system.

12. The level of ecological training and education must be raised, and the heightening of responsibility of the inhabitants of the Issyk-Kul region and of the public for the fate

of Lake Issyk-Kul must be promoted. Organizations and the public must be materially interested in a sparing attitude toward nature, and a system of appropriate fines for the opposite actions should be introduced. The primary organizations of a society for nature conservation should be created in all labor collectives, and the dissemination of nature conservation knowledge among the population must be activated. Programs linked to the questions of environmental conservation have to be introduced in the kindergartens and schools. Short courses in the comprehensive study of urgent ecological problems should be organized for teachers of the general education schools and the secondary special educational institutions, as well as for workers in the environmental protection system. Programs of ecological education and teaching aides for specialists in agriculture, industry, and the service sphere, as well as special programs for the dissemination among the population of knowledge regarding ecology and environmental conservation, with the aid of the mass media, should be developed. Ecological education courses for workers employed in tourism, as well as lectures on environmental preservation for vacationers should be organized. Educational and instructional efforts need to be intensified.

In view of the priceless cultural-historical significance of Issyk-Kul for the Kirghiz people, a package of educational and propagandistic programs should be worked out, the realization of which must involve the constant participation of radio, television, and the press in spreading the word regarding the conservation of Lake Issyk-Kul and of the cultural-historical monuments located within its basin.

Coastal and underwater archaeological investigations of monuments of history and culture ought to be expanded. A new stage in underwater investigations, which began in the summer of 1985 with the efforts of the Issyk-Kul historical-archaeological detachment of the Institute of History of the Academy of Sciences [AN] of the Kirghiz SSR, was marked by unique discoveries, in particular, of submerged cities of the ancient period and of the middle ages. The results of archeological field investigations, written sources, and archival materials attest to the unique monuments along the track of the ancient Great Silk Road, and to remarkable finds discovered on the bottom of the lake. All of this raises the question of the necessity to expand investigations in the waters of Lake Issyk-Kul.

### III. Scientific Support for the Solution of the Problem of Lake Issyk-Kul.

The study of Lake Issyk-Kul and its environs has been carried out by now for more than a century; however, only a comparatively small portion of the available information can provide a notion of the ecological situation in this region. From the point of view of ecology, the basin has been investigated extremely unevenly and incompletely. A planful, systematic, comprehensive study of the natural resources of Issyk-Kul has yet to be carried out.

The marked deterioration of the Baltic coast and Black Sea region, which has placed under threat their recreational attributes, and the very possibility of normal existence,

was the consequence of the irresponsible ignoring of the warnings of specialists regarding the violations of the elementary laws of ecological hygiene. A similar fate awaits Lake Issyk-Kul. The consequences may prove to be more serious and irreversible for Issyk-Kul, since its basin is completely devoid of external drainage, and all the products of pollution in it, in the final analysis, accumulate in the lake. The fastness, the internal drainage, the heightened susceptibility and vulnerability of the ecosystems of the basin of the lake place it in a special position, all the more so if its unprotectedness is not decreased in time. Therefore the standard, traditional approaches are inadmissible in relation to the basin of Lake Issyk-Kul. All types of economic activity must be decisively reviewed with a view to the complete cessation of any production activities which are incompatible with the natural processes of the transformation of energy and matter.

In the meantime, up to the present time practically all types of anthropogenic activity in the Issyk-Kul basin are inflicting harm, to one degree or another, on the environment, and are depriving the lake of a future, and a near future at that. And this is not because they are fundamentally incompatible with the objective of environmental protection, but because of the failure to observe elementary rules and techniques, the neglect of the requirements of ecological hygiene, and occasionally the absence of scientifically substantiated hypotheses.

The Issyk-Kul Scientific Center was organized in order to solve the problem of Lake Issyk-Kul. In addition to it a number of scientific institutions are operating on the coast of Lake Issyk-Kul, in particular, the Tyan-Shan Physical Geography Station and the scientific subdivisions of the Issyk-Kul State Reserve. In our opinion, it is necessary to consider the question as to whether to concentrate all these scientific institutions in one place and to turn them over to the Issyk-Kul Scientific Center.

The extreme necessity has arisen of drawing up a comprehensive program in relation to Lake Issyk-Kul. The scientific investigations should be carried out in accordance with the integral, regional, comprehensive "Issyk-Kul" scientific research program for the development of recommendations to assure ecological equilibrium in the Issyk-Kul basin, rational and balanced socioeconomic development with strict regard for the environment, for its physical geographic conditions (the state of the soil and plant cover), and for the objective national economic specialization of the basin.

The accomplishment of this program should be achieved using the methods of the various disciplines, namely those used in cartography, aerial photosurveys, geology, geomorphology, seismology, geography, economics, physics, biology, microbiology, radiobiology, soil science, ecology, biogeocenology, geobotany, medicine, etc. The program should be supplied with a sufficient number of highly-qualified personnel. It is assumed that, in addition to scientists, a wide range of specialists will be enlisted for the implementation of the recommendations for the optimization of natural resource utilization, on the regulation of the

anthropogenic burden on the ecosystem, and for the creation of the optimal territorial structure involving various modes of natural resource utilization.

The program consists of 10 units, including 48 subjects, in the resolution of which 24 academic and sectional institutes and higher educational establishments of the republic are participating. In it the ecological situation of the entire basin is being analyzed. Goals are being set. It has four appendices: a plan of scientific investigations; an appendix relating to the practical realization (implementation) of the results of scientific investigations; for the acquisition of scientific equipment; and for design and construction. Provision is made for 18.4 million rubles, including 6.1 million rubles for the XIII Five-Year plan, for the realization of the program. Of these, 2.9 million rubles in capital investments, including 1.5 million rubles for the acquisition of scientific equipment.

The basic orientation of the program is ecological, with the aim of producing real recommendations for the preservation of the inherent natural aspect of the Lake Issyk-Kul basin; therefore, as a priority, the evolution of national economic activity is regarded not as a goal in and of itself, but its transformation into that type which would correspond to the goals of the protection of the lake. An orientation has already been built into the program toward the maintenance and restoration of inherent natural milieux through a departure from extensive forms of management, and a shift to the ecologically literate utilization of resources, to no-waste technology, and to the forms of small-scale industry.

It is proposed that not only determinative investigations be carried out, i. e., to obtain some "snapshots" of the structure of ecosystems and geosystems (maps, registers, reference books), but that the processes taking place in them be studied, and that forecasts be provided of a number of current processes, on the basis of which a strategy to protect the environment and Lake Issyk-Kul itself is to be determined.

The creation of a high-mountain testing ground of biospheric and ecological investigations for the development of a strategy to preserve and protect the entire ecological complex of the Lake Issyk-Kul basin.

The Kirghiz Republic Committee for the UNESCO "Man and Biosphere" program and the Issyk-Kul Scientific Center of the Academy of Sciences of the Kirghiz SSR [AN KiSSR] will provide the scientific-methodological direction of the program.

The investigative ecological program will be based on the principles of integrality, comprehensiveness, and system-aticity.

**Integrality** defines the examination of the ecological situation in the Lake Issyk-Kul basin as an interdependant, reciprocally determined entity. The ecological metabolic model of the Lake Issyk-Kul basin, including investigation, transformation, interaction, the entrance and exit from the system of substance streams and of the balance of energy, should be constructed, in the final analysis, on the basis of

integrality. An integral assessment of the condition of and a forecast of change in the ecological situation in the region can be obtained as a result.

**Systematicity** adduces each element of the structure in accordance with the structure of the object. In it the units of the program are delineated, and their hierarchy and interdependence are established. It permits the revelation of the entirety of the description of the object, and the establishment of homogeneity in the study of its various elements.

**Priorities** are determined from the final aims of the program, and indicate the principal orientations of the research and practical measures in accordance with the optimization of the ecological situation within the framework of the predictable influences. The priorities are allocated within the program in accordance with the degree of significance for the integral representation of the object and of a specific aspect.

**Comprehensiveness** envisages the complete and objective reflection of the ecological situation, since the object under investigation is a process of diverse factors, the state and course of which depend on qualitatively diverse influences, as well as on the intrinsic internal laws of the subsystems composing it. This principle presumes the subordination of investigative subprograms to a unified objective, i. e., to the integral representation of the ecological situation.

The delineation of the principal, recreational-health improvement, orientation requires the complete restructuring of the entire national economic system in the basin, since the pursuit of mutually exclusive goals is leading, in the final analysis, to the loss of the principal value of the Issyk-Kul region, with the simultaneous diminution of the possibilities of other directions for its utilization, as a result of the aggravation of negative ecological consequences.

The principal priority orientations of the program's investigations have been determined:

- the comprehensive study of the aquatic and terrestrial ecosystems of the Lake Issyk-Kul basin, and their interactions;
- the working out of the ecological foundations of rational utilization of natural resources, of the optimization of the environment, recreation, nature conservation, and the socioeconomic development of the Issyk-Kul region;
- the study of the medical-biological and sanitary-epidemiological situation in the Lake Issyk-Kul basin;
- the carrying out of regular observations of the state of the abiotic and biotic environment (changes in the level of the lake and biota, the physicochemical characteristics of the air and water, the degree and sources of pollution);
- the introduction of contemporary techniques of ecological monitoring and forecasting (automation, computerization, remote sensing, aerial climate tracking, the creation of a data bank and of an ecological metabolic model).

It seems promising, for the more dynamic development of research, to establish contacts through the Commission on Problems of Ecology of the Academy of Sciences of the USSR [AN SSSR] with a number of foreign scientific research centers and international organizations for the formation of joint international programs, including programs concerning problems of the ecology of man and mountains. We are faced with an extremely serious effort to organize a scientific research high-mountain testing ground for biospheric and ecological investigations, and with predicting its international value, having made provision for the appropriate means and resources.

In connection with this, the participation in the investigations of the International Center for the Integrated Development of the Mountain Territories of the Himalayas and the Hindu Kush (ICIMOD [International Center for the Integrated Development of Mountains], Nepal, Katmandu), as well as of some other regional coordinational and scientific-methodological institutions of the MAB program represents great promise for the "Issyk-Kul" program; especially as this program is a constituent part of the all-union MAB program based on project 6a "Mountain Ecosystems and Their Changes Under the Influence of Human Activity".

UNESCO has proposed the creation of a program on lake-district ecotones within the framework of the "Man and Biosphere" program (MAB) in an appendix to the Memorandum on Scientific Collaboration Between the Academy of Sciences of the USSR and UNESCO for the Period 1990-91 in the Field of Ecology, and in this connection, a review of the possibility of the inclusion in the program of a special project on the ecotones of Lake Baykal and the Aral Sea. We have come back with a request to include in this program a project on the ecotones of Lake Issyk-Kul as well, having insured its coordination with the analogous projects on the ecotones of Lake Baykal and the Aral Sea.

The participation of foreign partners in the investigations would strengthen them and impart to them an international character, and would open a new page in knowledge and the development of notions regarding the unique Lake Issyk-Kul basin. It is necessary, in order to improve the ecological situation, to achieve inclusion in the World Heritage List of the Lake Issyk-Kul basin as a complex of unique ecosystems with a distinctive fauna, flora, terrain, and natural-recreational potential.

Lake Issyk-Kul and its basin, which include a piedmont, and medium and high-mountain terrain with surrounding gigantic ranges, and enormous open areas of glaciers and snowbanks, as a unitary ecological complex of mountains, require in-depth development of resources of this unique territory, and the development of a unified conception of the protection of its riches in accordance with the intelligent organization of the interrelationships of man and nature.

### Status of Preventive Immunizations in the Country and Measures to Improve It

917C0474B Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian Vol 111 No 12, Dec 90 pp 44-50

[Article by M. I. Narkevich, G. G. Onishchenko, V. M. Bolotovskiy, A. V. Pichushkov, G. F. Lazikova, L. S. Boyko and V. N. Sadovnikova, Main Epidemiological Administration of the USSR Ministry of Health, and Central Scientific Research Institute of Epidemiology of the USSR Ministry of Health, Moscow]

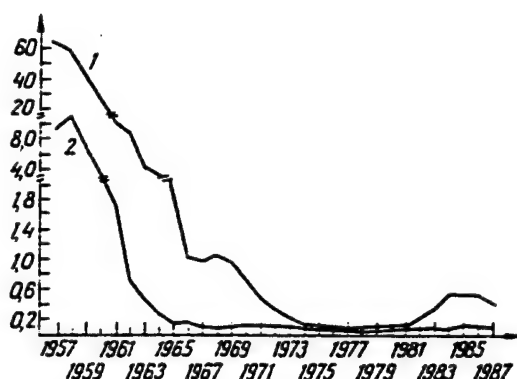
UDC 614.47+616.9-084.47]:008(47+57)

[Text] Preventive immunizations of infectious diseases in the USSR are a highly effective measure targeting the most important regulator of the epidemic process—the population's immunity. Owing to vaccinations carried out in the country, morbidity and mortality due to infections such as diphtheria, whooping cough, poliomyelitis, measles and tetanus have decreased significantly. For example, in comparison with 1957, morbidity decreased by a factor of 162.6 for diphtheria, 51 for whooping cough, 15.7 for measles and 156 for poliomyelitis. The decrease in occurrence of these infections in the USSR in 1957-1987 is graphed in figures 1 and 2, but the rate of this decline decreased significantly in the last seven years. Diphtheria morbidity increased from 0.13 (1980) to 0.38 (1987) per 100,000 population, while that of whooping cough went correspondingly from 5.2 to 7.1. The highest diphtheria morbidity (on an average in 1985-1987) was recorded in the Turkmen SSR—1.2, in the Tajik SSR—1.1, and the Uzbek SSR—1.19, and in the RSFSR—0.62 per 100,000 population (Figure 3). In comparison with the preceding five-year period, a tendency for growth of diphtheria morbidity was noted in the Ukrainian, Belorussian and Kazakh union republics.

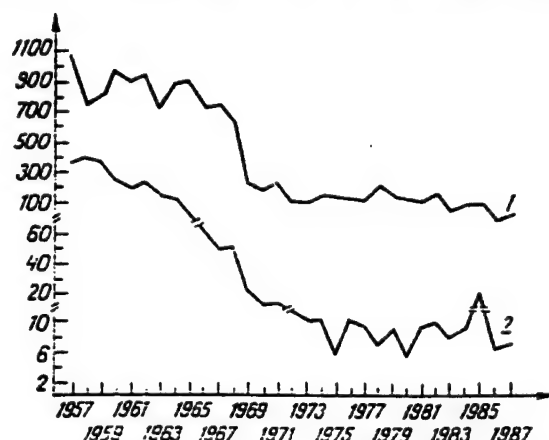
**Table 1. Proportion of Children Up to 14 Years Old Among All Diphtheria Patients in 1987 (percent)**

Republic	Diphtheria Cases	Children Up to 14 Years Old
USSR	1076	35.68
RSFSR	755	29.40
Ukrainian SSR	92	27.17
Belorussian SSR	34	23.52
Uzbek SSR	85	73.29
Kazakh SSR	33	57.57
Georgian SSR	8	90.0
Azerbaijan SSR	2	100.0
Kirghiz SSR	9	55.55
Tajik SSR	22	68.18
Turkmen SSR	32	62.50

Seventy percent of persons catching diphtheria in 1987 in the RSFSR were older than 14 years and incompletely vaccinated (Table 1). At the same time children up to 14



**Figure 1. Diphtheria (1) and Poliomyelitis (2) Morbidity in the USSR From 1957 to 1987: abscissa—year, ordinate—morbidity per 100,000 population**



**Figure 2. Measles (1) and Whooping Cough (2) Morbidity in the USSR From 1957 to 1987: abscissa—year, ordinate—morbidity per 100,000 population**

years old in the Uzbek, Tajik and Turkmen SSR represented correspondingly 73.3, 68.2 and 62.5 percent of the cases of illness.

Major diphtheria outbreaks were recorded in recent years in the Karakalpak ASSR and in the Tajik and Kazakh SSR.

In 1988, 58 persons, including 39 military servicemen, caught diphtheria in Leninsk, Kzyl-Orda Oblast, Kazakh SSR. Eighty-two carriers of *Corynebacterium diphtheriae* were revealed among persons who came into contact with patients. Two of the patients died. Analysis of the outbreaks revealed unsatisfactory organization of immunization affairs, and late initiation of epidemic control measures. Serological tests revealed many persons without immunity: among children in preschool institutions—50 percent, among primary schoolchildren—16 percent, among children outside the educational system—84 percent.

Revaccination every ten years of the adult population was introduced in order to stabilize diphtheria morbidity in the



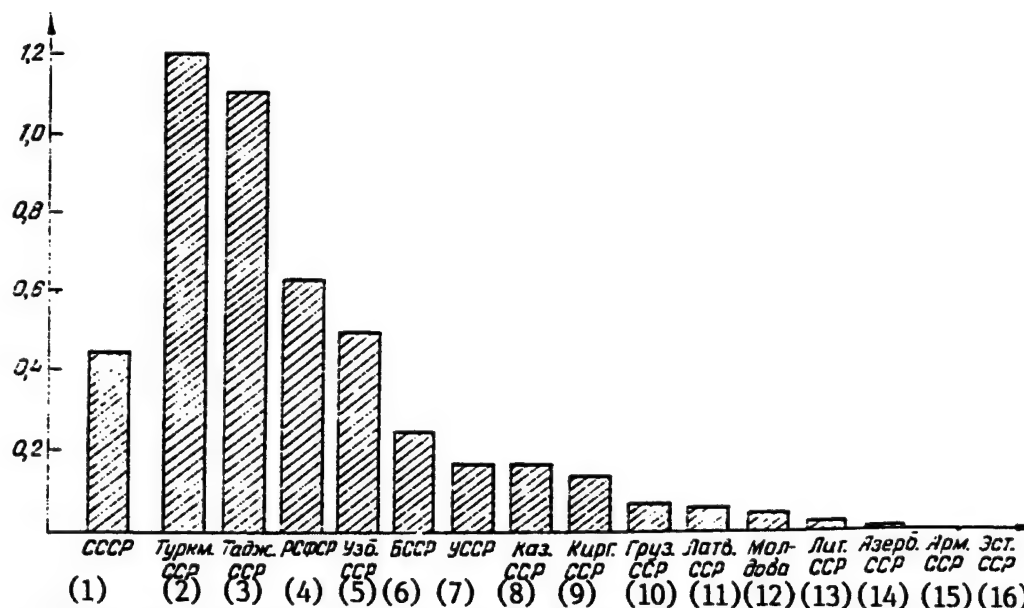


Figure 3. Diphtheria Morbidity in the Union Republics in 1985-1987: abscissa—union republics; ordinate—morbidity per 100,000 population

Key: 1. USSR 2. Turkmen SSR 3. Tajik SSR 4. RSFSR 5. Uzbek SSR 6. Belorussian SSR 7. Ukrainian SSR 8. Kazakh SSR 9. Kirghiz SSR 10. Georgian SSR 11. Latvian SSR 12. Moldova 13. Lithuanian SSR 14. Azerbaijan SSR 15. Armenian SSR 16. Estonian SSR

country. However, this measure made it possible to halt the development of the epidemic process only in the RSFSR.

The epidemic situation with respect to whooping cough worsened in 1988: In comparison with 1987, the number of patients increased by a factor of more than 2.2 in 1988.

The highest whooping cough morbidity in the last three years was recorded in the RSFSR—15.7, Tajik SSR—12.9, Armenian SSR—9.4, and Estonian SSR—11.2 per 100,000 population (Figure 4). On the whole, the unfavorable status of whooping cough is explained primarily by universal unjustified replacement of AKDS [associated whooping cough, diphtheria, tetanus] vaccine by ADS-M

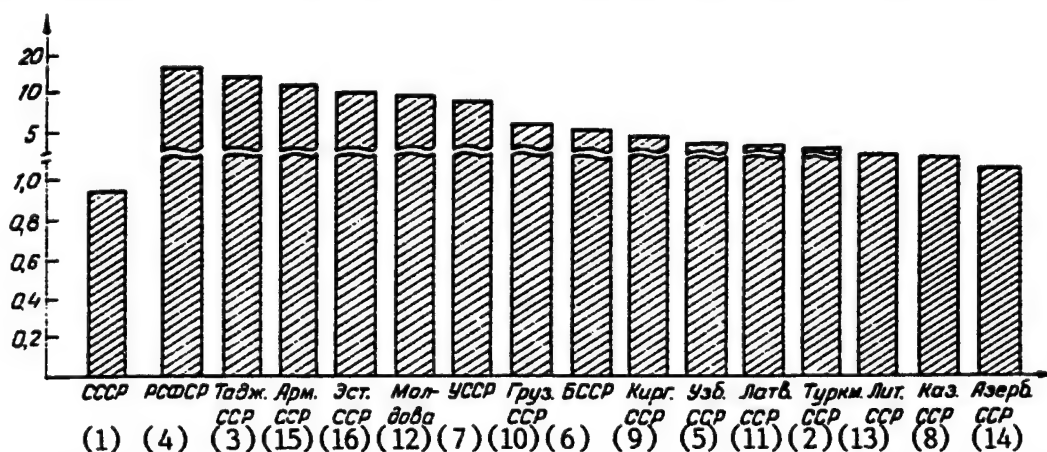


Figure 4. Whooping Cough Morbidity in the Union Republics in 1985-1987: abscissa—union republics; ordinate—morbidity per 100,000 population

Key: 1. USSR 2. Turkmen SSR 3. Tajik SSR 4. RSFSR 5. Uzbek SSR 6. Belorussian SSR 7. Ukrainian SSR 8. Kazakh SSR 9. Kirghiz SSR 10. Georgian SSR 11. Latvian SSR 12. Moldova 13. Lithuanian SSR 14. Azerbaijan SSR 15. Armenian SSR 16. Estonian SSR



[expansion unknown] anatoxin not containing the whooping cough component. Thus the number of children initially immunized with ADS-M anatoxin increased from 16.5 to 21.7 percent in Arkhangelsk and from 25.2 to 40 percent in Novodvinsk between 1984 and 1987. In the Belorussian SSR the number of children immunized only with ADS-M anatoxin tripled. Up to 10 percent of children vaccinated against diphtheria and tetanus remain unimmunized against whooping cough in Alma-Ata. Children up to one year old are beginning to be drawn into the epidemic process. Whooping cough takes a serious course in them, and the possibility of death is not excluded.

A serious poliomyelitis epidemic situation persists in most Central Asian republics and in the Kazakh and Azerbaijan SSR. The highest morbidity in 1985-1987 was in the Turkmen SSR—0.68, the Azerbaijan SSR—0.37, the Tajik SSR—0.37, the Uzbek SSR—0.22, and the Kazakh SSR—0.047 per 100,000 population (the USSR average was 0.06). In 1987, 81.8 percent of all poliomyelitis patients in the country were registered in these republics. In the Turkmen SSR, 44 cases of poliomyelitis were recorded in 1988, as compared to 34 in 1987, while in the Uzbek SSR the figures were correspondingly 39 as compared to 56.

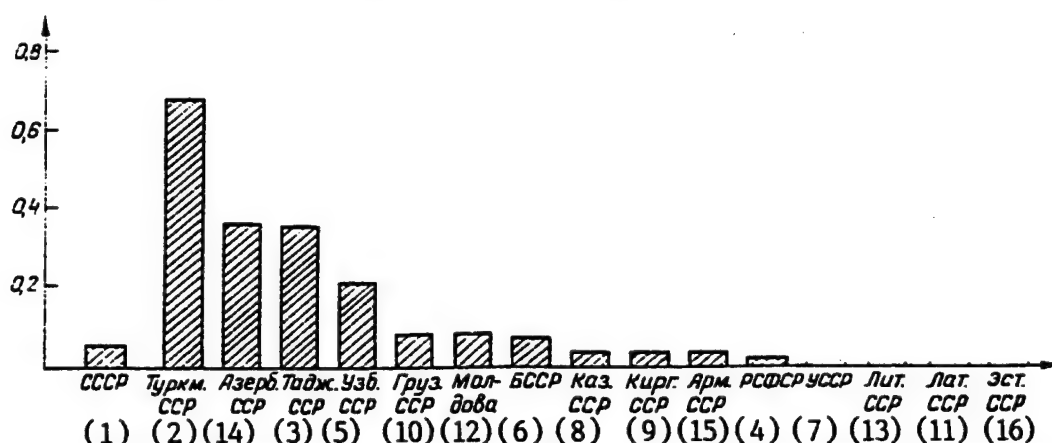


Figure 5. Poliomyelitis Morbidity in the Union Republics in 1985-1987: abscissa—union republics; ordinate—morbidity per 100,000 population

Key: 1. USSR 2. Turkmen SSR 3. Tajik SSR 4. RSFSR 5. Uzbek SSR 6. Belorussian SSR 7. Ukrainian SSR 8. Kazakh SSR 9. Kirghiz SSR 10. Georgian SSR 11. Latvian SSR 12. Moldova 13. Lithuanian SSR 14. Azerbaijan SSR 15. Armenian SSR 16. Estonian SSR

A significant decline in measles morbidity has been achieved. While average measles morbidity in 1980-1984 in the USSR was 122.5 per 100,000 population, in three years of the current five-year period (1985-1987) this indicator was down to as much as 74.9. In 1988 the decline in morbidity continued in almost all union republics, except for the RSFSR and the Kazakh, Georgian, Tajik and Turkmen SSR.

Morbidity differences in different territories are of interest. For example the average morbidity indicator for

measles over a three year period (1985-1987) is 11.4 for the Latvian SSR and 178.8 per 100,000 population for the Turkmen SSR (Figure 6).

Table 2. Economic Loss Inflicted by Measles, Diphtheria and Whooping Cough in 1958, 1985-1987 (in millions of rubles)

Infection	1958	1985	1986	1987
Measles	241,918	40,375	24,371	28,204
Diphtheria	55,381	0,684	0,523	0.489
Whooping cough	96,116	6,410	2,402	
Total	293,417	47,470	26,997	31,096

The social and economic loss inflicted by these diseases continues to be great. In one year over 1,000 persons in the country died from diphtheria, whooping cough and measles, while the material loss resulting from these diseases was 31.1 million rubles in 1987 (Table 2).

Of the 50 percent of children that could be vaccinated within the first year of life, 33.6 percent were immunized

against diphtheria and whooping cough and 35.5 percent were immunized against poliomyelitis in Moldova, while in the RSFSR the figures were correspondingly 35.4 and 35.3 percent, in the Estonian SSR they were 26.9 and 27 percent, and in the Belorussian SSR they were 38.4 and 38.7 percent (the figures for the country as a whole were 39.6 and 40.08 percent).

A tendency for the number of persons immunized against diphtheria exhibited a tendency to decline from 57.7 percent in 1983 to 44.5 percent in 1986 in the Turkmen SSR; the corresponding figures for other republics are from

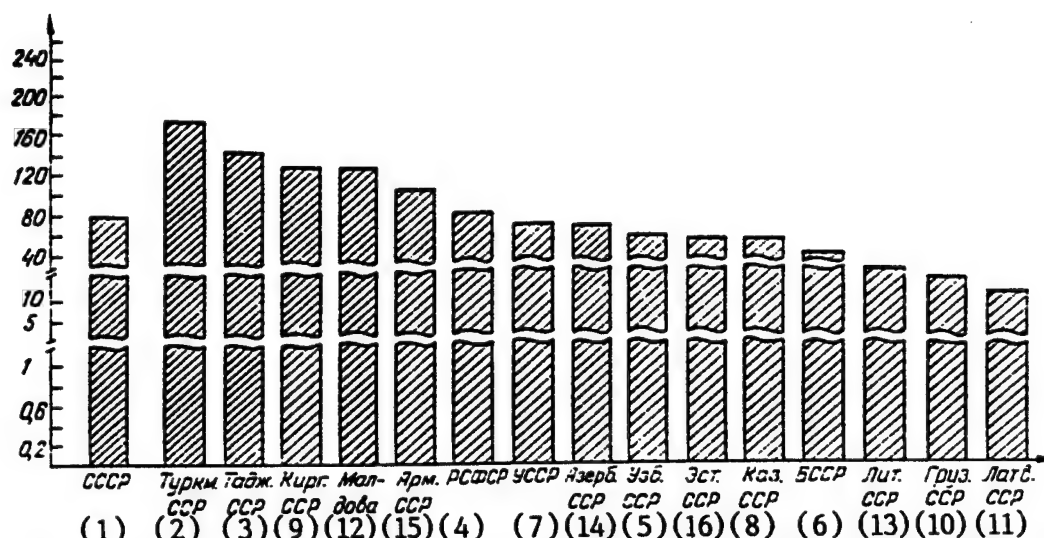


Figure 6. Measles Morbidity in the Union Republics in 1985-1987: abscissa—union republics; ordinate—morbidity per 100,000 population

Key: 1. USSR 2. Turkmen SSR 3. Tajik SSR 4. RSFSR 5. Uzbek SSR 6. Belorussian SSR 7. Ukrainian SSR 8. Kazakh SSR 9. Kirghiz SSR 10. Georgian SSR 11. Latvian SSR 12. Moldova 13. Lithuanian SSR 14. Azerbaijan SSR 15. Armenian SSR 16. Estonian SSR

45 to 42.6 percent in the Uzbek SSR and from 49.6 to 47.3 percent in the Armenian SSR.

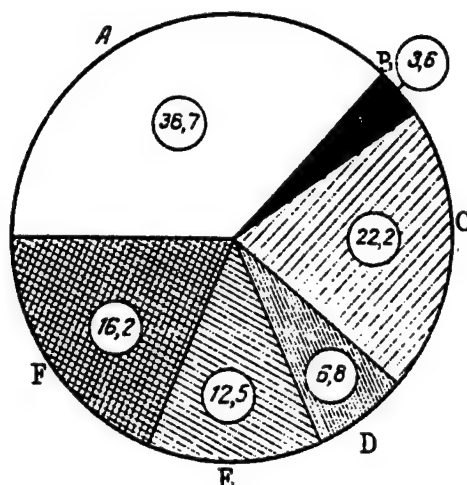
The group of children up to one year old immunized against poliomyelitis decreased from 43.8 percent in 1980 to 42.6 percent in 1986 in the Ukrainian SSR, and correspondingly from 46.7 to 43.8 percent in the Uzbek SSR, from 49.3 to 48.4 percent in the Armenian SSR, and from 60.4 to 54.4 percent in the Turkmen SSR.

Successes in reducing the occurrence of a number of infectious diseases, the unavoidability of unfavorable reactions to the vaccines employed, and weakening of explanatory efforts among parents and polyclinic pediatricians resulted in unjustified abandonment of immunizations. A review of the contraindications against immunizations by the USSR Ministry of Health did not produce the anticipated results. Positive experience accumulated by the Leningrad Institute of Children's Infections of the RSFSR Ministry of Health in comprehensive measures to vaccinate children has not been introduced to a sufficient extent. Neither the union nor the republic ministries of health are exhibiting adequate persistence and consistency in disseminating this experience.

The directors of many therapeutic, preventive and health resort institutions are not devoting adequate attention to upgrading the qualifications of medical workers that give preventive immunizations, they are not monitoring their actions, they are not holding pediatricians responsible for the occurrence of infections that can be controlled by vaccines, they are not ensuring proper storage and issue of vaccines, and they are promoting concealment of postvaccinational complications.

Among the complications that were recorded in 1986-1988 in conjunction with administration of vaccines, 38.7 percent were associated with AKDS vaccine, and 22.2 percent were associated with measles vaccine (Figure 7). Complications associated with administration of ADS-M vaccines (3.6 percent) and parotiditis vaccine (6.8 percent) represent the smallest proportions. Complications resulting from unjustified or mistaken administration of vaccines continue to arise. This undermines trust in the physician and in vaccinations in general. However, such facts are not being evaluated appropriately by public health agencies and institutions, and in the newspapers. The organizational efforts of the health ministries of the Turkmen, Uzbek, Tajik and Kazakh SSR associated with preventive vaccinations against infectious diseases remain at a low level. Board meetings of these ministries are formal in nature on the whole, and the results are poor. Local inspections are not methodically carried out. Not only immunization of the total population and the quality of the vaccines but also violation of the conditions of transporting vaccines from manufacturing enterprises to therapeutic and preventive institutions play a significant role in reducing infectious morbidity. Medical institutions of the Central Asian republics, and particularly the Turkmen, Uzbek and Kazakh SSR, suffer an acute shortage of refrigerators, portable coolers, freezers and cold storage units. Such a situation results in unsatisfactory storage of vaccines, reduction of the effectiveness of preventive vaccinations, and a decrease in the population's confidence in immunizations.

Many shortcomings in the work of public health institutions concerned with preventive vaccinations of children against infectious diseases are associated with personnel



**Figure 7. Proportion of Postvaccinational Complications Recorded in 1986 and in the First Half of 1988 in Response to Vaccination by AKDS, ADS-M, Measles, Parotiditis, Poliomyelitis and Other Vaccines: a—AKDS; b—ADS-M; c—measles; d—parotiditis; e—poliomyelitis; f—influenza, encephalitis, BTsZh [expansion unknown] and other vaccines**

problems. In 1987, 1,007 of the country's pediatric departments were not staffed by physicians. Sufficient attention is not being devoted to reducing personnel turnover, especially in rural areas, and the available specialists are not being used sensibly.

Serious disproportions have arisen in the distribution of pediatricians among different regions of the country. Thus while children up to 14 years old make up 31.4-42.4 percent of the entire population of the Uzbek, Kazakh, Tajik and Turkmen SSR, the availability of pediatricians in these republics varies from 5.2 to 5.7 per 10,000 population. At the same time the number of children up to 14 years old in the Estonian SSR and RSFSR is almost twice less (21.9 and 22.6 percent respectively), but the availability of physicians of this profile is actually at the same level (correspondingly 5.7 and 5.5 per 10,000 population).

Diagnosis of the state of the immune system has not been organized in the country. This makes it impossible to move up to wider individualized vaccination of weaker children and adolescents suffering a reduced immune status.

Observations of the collective immunity of the population in relation to infections that can be controlled by specific preventive drugs, begun in 1982, require further improvement.

State surveillance over the quality of vaccines and other immunological preparations by the State Scientific Research Institute of Standardization and Control of Biomedical Preparations imeni L. A. Tarasevich is unsatisfactory; violations are not being met with the appropriate penalties.

Vaccines currently being used and developed are not monitored for immunological safety, and the existing procedures for testing immunobiological preparations foresees only analysis of reactions, harmlessness and specific activity.

The equipment of enterprises producing the bulk of commercial immunobiological preparations is often in an unsatisfactory sanitary and technical condition.

Two series of vaccines against epidemiological parotiditis, one series of measles vaccine and one series of rabies vaccine were recalled from the country's medical institutions in the last five years. That they did not meet sterility requirements and anaphylactic shock requirements was established only after complications appeared among immunized individuals.

In 1987, 104 series of immunobiological preparations were discarded as a result of spot checks. This included vaccines against tuberculosis and influenza. In the last five years, the quantity of rejects discovered by spot checks increased from 0.84 percent in 1983 to 3.24 percent in 1986. Preventive immunizations using a new trivalent influenza vaccine, which was delivered from the Ufa Scientific Research Institute of Vaccines and Sera of the USSR Ministry of Biomedical Industry in unusable condition, were cancelled in fall 1988 in a number of regions of the country.

Scientific research institutes of the USSR Ministry of Health, the USSR Academy of Medical Sciences and the health ministries of the union republics did not support development and practical introduction of accomplishments in the areas of improving existing generations of vaccines and developing new ones, and they failed to provide practical assistance to public health institutions.

The country lacks a coordinating organ capable of developing and determining the strategy and tactics of preventive immunizations against infectious diseases.

To eliminate the existing shortcomings in preventive vaccinations, the following urgent measures must be implemented:

- to develop, through the efforts of medical institutions, specific measures to expand serological control over the population's immunity against widespread infectious diseases;
- to make directors of public health agencies and institutions more responsible for creating the appropriate conditions for conducting preventive immunizations, and for the quality of explanatory efforts among the population aimed at achieving informed consent for immunizations, to raise the responsibility of executives for the end results of their work, to staff pediatric departments with medical personnel, and to implement the necessary measures to prevent personnel turnover;

- to organize an all-union center for preventive immunizations on a functional basis under the direction of the Central Scientific Research Institute of Epidemiology of the USSR Ministry of Health, and to create regional centers out of existing and newly created immunological subdivisions in order to study the population's immune status and observe its changes, improve serological control over the status of collective immunity, and coordinate scientific research and practical measures associated with preventive immunizations;
- to review the system for specializing and improving physicians in regard to preventive immunizations;
- to develop and introduce methods by which to monitor the immunological safety of vaccines;
- to develop a research program aimed at creating new and improving existing vaccines, and a program to study the features of preventive immunizations in different regions of the country with the purpose of developing regional immunization calendars;
- to implement specific measures to intensify state surveillance over the quality of medical immunobiological preparations—ones foreseeing improvement of its structure, provision of instruments and equipment, and the training of scientific personnel;
- to develop a scientific program for improving live influenza vaccine, to strengthen the material and equipment base, and to take steps to train scientific personnel for subdivisions participating in such development, and to augment the role of the Influenza Institute in coordinating all research under this program;
- to examine the question of an all-union school of progressive experience in immunizing children in the first years of their life in Leningrad and in a number of oblasts of the northwestern region of the RSFSR, under the sponsorship of the Leningrad Scientific Research Institute of Children's Infections of the RSFSR Ministry of Health;
- to prepare specific measures in support of participation by the USSR Ministry of Health in the Global Program to Eliminate Poliomyelitis Among Children by the Year 2000;
- to require the USSR Academy of Medical Sciences to create a specific-purpose comprehensive program of scientific research aimed at studying the mechanisms behind development of immunopathological states, the possible injurious action of administered vaccines, and the chemical and physical factors of the surrounding environment. © COPYRIGHT: Izdatelstvo "Meditsina", 1990

#### **Guidelines and Methods for Control of Venereal Diseases and Prevention of AIDS**

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BELORUSSII in Russian No 12, Dec 90 (manuscript  
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[Article by A. P. Vitorskiy, candidate of medical sciences, Republic Clinical Dermatovenereological Dispensary of Belorussian Ministry of Health (chief physician: V. P. Soroka)]

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[Excerpts] Abstract: Considering the epidemiological similarity of AIDS and venereal diseases, the basic guidelines and methods of controlling diseases transmitted primarily via the sexual route are listed; the need for their active use in the work of all medical institutions is indicated. Logical proof is offered for the desirability of designating venereological dispensaries as the chief institutions responsible for the status of AIDS control in our country. Key words: AIDS, venereal diseases, sexual route, control methods, venereological dispensaries.

Fortunately, the incidence of AIDS is still low in the USSR. As of 20 October 1989 there were a total of 437 HIV-infected foreigners and 377 Soviet citizens. The diagnosis of AIDS was made in 19 people, and 13 of them have already expired. The situation is also relatively good in BSSR. There, a total of 41 HIV-infected individuals (out of 2,640,710 tested) have been detected since laboratory diagnostic tests were begun (1987); 28 of these cases were among temporary foreign residents of the republic and 13 were Soviet citizens (data as of 1 October 1989).

The later onset of the AIDS epidemic in our country enables us and requires that it be countered with consideration of the information that has already been accumulated about this infection. These are primarily data about the clinical manifestation of disease and information about the routes of its spread.

According to the data from the WHO summary used above, AIDS is manifested clinically in the European zone by opportunistic infections (74.1 percent), development of Kaposi sarcoma (13.2 percent), lymphoma (2.9 percent), HIV encephalopathy (2.5 percent), HIV emaciation syndrome (1.8 percent) and other diseases (5.5 percent). A total of 218,157 cases were analyzed.

Epidemiologically, AIDS is closest to typical venereal diseases. The similarity of these infections has already been considered in a number of known directives and methodological materials.

Considering the epidemiological similarity, one should actively adopt the guidelines and methods tested by venereologists in working on prevention and detection of AIDS. All medical personnel must be proficient in some of them.

First of all, there is the important guideline of the approach to this disease as sociohygienic and venereal (or primarily venereal, considering the nature of its spread), and to its incidence as a whole as not only a medical problem, but also a social one.

Each case of HIV infection must be viewed as the appearance of a new point source. Evaluation of the epidemiological significance of an individual patient (in the sense of his actual and potential contribution to the process of "reproduction" of infection) should be made with consideration of both the duration of the infection (from the time it was contracted to detection and isolation, or even death, i.e., the basic epidemiological morbidity factor) and the sexual activity of the patient (behavior in general and



during the period of infection that is dangerous to others in particular, which is the main sociohygienic factor). Numerous other factors that affect the incidence of venereal diseases are manifested primarily through their effects on the two above-mentioned main factors.

The overall coefficient (index) of epidemiological significance of a sick case is not the sum, but the quotient obtained after multiplying the above main factors.

Epidemiological investigation of sources (microsources) must be directed primarily toward finding sexual (particularly homosexual) contacts and sources of infection. Work with each individual patient must be pursued according to an individual plan (with consideration of psychological and sociohygienic distinctions). Only an experienced clinician should be entrusted with such work, and it must be carried out continuously. Special attention should be given to tracking the epidemiological chains and analysis of outbreaks of infection. If necessary, one should also resort to international notification.

In our opinion, both infected individuals and their contacts should be placed on dispensary rolls and under observation at venereological dispensaries. Observation begins at the time of detection of infection and ends with total isolation of the patient from others. Duration of medical observation of contacts should be determined on an individual basis (and, of course, with consideration of the terms indicated in scientifically validated recommendations and instructions).

The epidemiological situation concerning venereal diseases and, consequently, AIDS should be assessed in any particular area with consideration not only of morbidity incidence and rates, but also the epidemiological impact of individual cases, existence of contacts (as potential victims), as well as epidemic-control work that has already been carried out or has not been performed (for example, taking into consideration existence of contacts that have not yet been detected, let alone a source of infection). One must also bear in mind the situation in the surrounding area: when assessing the epidemiological situation in a rayon, one must also consider the situation in the oblast of which it is a part, and when assessing an oblast one must consider the situation in the republic, etc. It is also desirable to assess simultaneously the epidemiological situation for all venereal diseases, since one cannot be reassured, for example, about the situation concerning syphilis (or AIDS) when the indicators are high for incidence of gonorrhea.

One can refer to actual (overt) and discrete (potential) epidemiological problems. One can define the parameters of an objective evaluation of the situation, objective parameters of amount and quality of epidemic-control work. It is important to maintain alertness about epidemics continuously, actively and everywhere, one should fight against negative phenomena that are instrumental in the spread of diseases that are transmitted primarily via sexual intercourse. For example, with the appearance of

AIDS, work has to be intensified by many times in the area of controlling self-treatment, illegal treatment and private practice in venereology.

In the process of controlling venereal diseases, special attention is devoted to the so-called risk group. Existing directives include the following in the list of such groups: individuals who have had sexual contact with HIV-infected patients; homosexuals and bisexuals; patients with syphilis, gonorrhea and other diseases of the genitourinary system that are transmitted sexually; individuals who have had sexual contact with such patients, prostitutes and others who are sexually active; individuals seeking care at night preventoriums of the venereal service; patients with dermatological diseases presenting with symptoms encountered in AIDS victims and HIV carriers; individuals who come voluntarily for an anonymous AIDS test.

The Belorussian Ministry of Health has sent special instructions to republics medical institutions with indications on how to keep records and examine these population categories. Steps are being taken to organize such screenings with retention of the principles of medical ethics.

Medical confidentiality should be considered the main principle, and it means that information about patients and individuals who are screened can be made known only to a limited number of medical workers, i.e., only to those for whom such information is essential for implementation of epidemic-control and preventive measures.

Provided that the work is well thought-out and properly organized, the venereologists of our country can and must provide a reliable screen against the spread of sexually transmitted diseases. Involvement of medical workers in other fields, as well as concerned nonmedical services and institutions, in the control of such diseases should be in the form of cooperation with the venereological service, execution of some preventive measures with transmission of obtained information to zonal institutions in charge of the problem, as well as health education of the public. Sanitary and epidemiological institutions must provide strict monitoring of fulfillment of duties by all who are involved in such work, they must activate participation in the control of negative phenomena affecting the epidemiological situation, types of infections and so-called risk factors.

### Conclusion

By virtue of the epidemiological similarity of infections, for the control of AIDS one should make active use of the guidelines and methods of controlling venereal diseases. In our opinion, venereologists and the specialized medical service in this field can and must be in charge of the problem of preventing this disease. © COPYRIGHT "Zrakovokhraneniye Belorussii", 1990

### State Program for Environmental Protection

917C0675A Moscow ZASHCHITA RASTENIY,  
in Russian No 1, Jan 91 pp 4-5

[Article on State Program for Environmental Protection]

[Text] The draft of the "State Program of Environmental Protection and Rational Utilization of the Natural

Resources of the USSR for 1991-1995 and For the Future Up Until 2005" was published last year in "Pravitelstvenniy vestnik" No. 40. The program has been worked out thoroughly, the responsible officials have been named, and the sources and amounts of financing and accountability measures for the violation of proposed statutes have been indicated.

It is affirmed in the draft that today's ecological condition of the country's territory inspires serious alarm. The pollution of the atmosphere, waters, and lands by substances which are harmful to man, as well as for the plant and animal world, is the most acute and urgent of all the problems of the environment. It is indicated that the solution of these problems is an indispensable condition for the support of stable rates of the economic and social development of the country.

Specific figures are cited and regions of the greatest ecological trouble are named in the draft of the State Program. Pesticides do not figure in the most important causes of the creation of critical situations; however, it is noted, for example, that pollution of soils with pesticides has been identified on 50-55 million hectares; the MAC [maximal allowable concentration] [PDK] of pesticides and mineral fertilizers have been exceeded in many bodies of water of the Turkmen and Uzbek SSR and of the Republic of Moldavia, in Krasnodar Kray and other regions of the country. The effect on nature of other agricultural factors, of the erosion of soils, their overcompression as the result of the use of heavy technology, and the irrational utilization of lands are also significant. The forest resources of the country are in danger. From 10,000 to 30,000 forest fires are recorded annually, covering an area from 0.5 to 2.1 million hectares; foci of pests and forest diseases have been identified on 1-2 million hectares.

The maintenance of an ecologically safe environment which is favorable for health, the assurance of rational, non-exhausting utilization of natural resources, balance in the processes of the reproduction of natural resources, the preservation of the genetic pool, species and terrain diversity of nature, and the assurance of the ecological security of the country and the planet as a whole are deemed to be the strategic objective of the Soviet state. At the first stage, the ensuring of the prevention of the worsening quality of the environment through putting things in order and reinforcing technological discipline is planned; then the mobilization of financial and material resources for the intensification of nature conservation and environmental restorative activity is proposed.

The document is extensive. It defines a number of general and special measures for the country as a whole and by regions. Naturally, these measures, in whole or in part, touch upon questions of the safety in the utilization of chemical agents for the protection of plants. Thus, the creation of a unified system of scientifically substantiated technical norm documents which assure the regulation of environmental conservation activity and the development of the indices of the ecological capacity of the territories is among the paramount objectives. The economic mechanism of the implementation of the program is being formulated. Thus, a system of payments for the utilization

of natural resources is being introduced, including compensation for the removal of natural resources from purposeful utilization or for the deterioration of their quality, for the discharges of contaminant substances, fines for the violation of rules and norms of rational utilization of natural resources, an additional tax on the revenue of enterprises producing ecologically dangerous products [and/or] using ecologically dangerous technologies. At the same time, tax concessions are envisaged when an enterprise undertakes measures directed toward the protection of the environment.

Here we may at once define one of the aspects, which is the most important for us, of the application of the economic policy introduced: the chemical method of control. At the present time there are practically no material incentives to guide a farm toward the priority utilization of safe methods and agents. Is this not the reason that many hothouse combines practice massive chemical treatment, even though they have the capacity to avoid them by organizing biological protection? With the introduction of the new legislation those operations which have introduced biometods will pay lower taxes. At the same time, it is necessary to compensate budgetary losses, and enthusiasts have to solve protection problems by means of immoderate chemicalization alone.

And there are also requirements relating directly to plant protection. Thus, it is deemed necessary:

—"to accomplish the reduction of the use of toxic chemicals and the optimization of the utilization of mineral fertilizers, to forbid the use anywhere of pesticides which are resistant to degradation, and to embark in 1991-1995 on the carrying out of efforts for the cleansing of pesticide contamination from plowed fields;

—"to introduce biological techniques for the protection of agricultural crops on an area of 55 million hectares."

Serious limitations have been placed on agricultural activities in connection with the necessity of saving the integrity of the plant and animal world. This is not a simple problem. For example, how do we evaluate our activities which are associated with the purposeful destruction of weeds and harmful insects, and at the same time, the inevitable destruction of useful or neutral agrocenoses? Somehow this question has been left untouched for years in the publications of scholars. But life demands [that we do evaluate] this!

In the program draft, incidentally, there is, among other lines of research, the following point: the development of a general philosophical conception of the interaction of society and nature, of a theory of the ecology of humanity which reflects the fundamental multilevel relationships of humanity and the environment.

The creation of a national service for the monitoring of environmental contamination [OGSNK] is envisaged; a complex of measures for ecological upbringing and education, for the training of cadres, and for the organization of state monitoring of environmental protection is being worked out. It is felt that a law on the protection of plants

in the USSR should be among these measures; the need for this development has already been discussed in this journal. After all, how much we have already said about the fact that if the existence of the national service for the protection of plants is not consolidated legislatively, if this service is left under parochial departmental subordination, it will be a long time before we are done with the lack of standards and irresponsibility in this important and environmentally dangerous branch of agriculture. How many times have proposals been advanced and direct demands made that the complex work of the plant sanitary inspector not be entrusted to people without special education? It would be a good thing if this demand were reflected in the draft of the State Program and in the laws supporting it.

It's true that a different view must be heard: Why make things complicated? There is administrative responsibility, even criminal liability; material incentives could be used on violators. Isn't this enough?

No, it's not enough! Of course, the violator can be fined, punished, but the harm will have already been done as the result of his incompetent, unauthorized actions! And such harm can be extremely significant and can spread not only to the farm responsible for it, but to entire regions, to thousands and even millions of people. And one must think not so much as to how to punish the violator, but as to how to exclude him. After all, the driver who has allowed an accident to happen on the road will not remain unpunished. Yet, nevertheless, no one will allow a person who has no right to drive a car to sit behind the wheel. And a mishap on the road is much less significant in social terms than the massive contamination of fields, of bodies of water, of the atmosphere, than the selling of products with pesticide residues above the allowable limits.

These are several of the ideas which have occurred to us upon the first reading of the draft of the State Program. Readers of this journal can read this document in its entirety in "Pravitelstvennyy vestnik", and can make their own suggestions regarding its working out to completion. When this issue was being prepared, the draft had not been reviewed by the Supreme Soviet of the USSR. But if in fact the program is ratified soon, your ideas may be taken into account when the follow-up sweep of materials necessary for its practical implementation is processed.

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### **Natural Bioregulators and the Harvest**

917C0675C Moscow ZASHCHITA RASTENIY  
in Russian No 1, Jan 91 pp 14-15

[Article by P. K. Knitya, Director of the Laboratory of the Institute of Ecological Genetics of the Moldavian SSR Academy of Sciences [AN SSR]]

[Text] Over 100 steroidal compounds of diverse chemical structure, so-called bioregulators that possess a broad spectrum of biological activity, have been isolated from plant sources in our institute.

The bioregulators are powdery substances of various hues, from brown to white, that are stable to the action of light, hygroscopic, and readily soluble in water. They can be stored in hermetically sealed packing at room temperature for three years.

We have been able, by means of bioregulators which are capable of influencing the metabolism of plants as immunizers, to enhance the resistance of plants to a complex of diseases, including such widespread diseases as bacterial black spot, wilt, mosaic, brown rot, and others.

This effect can be achieved by various means: pre-planting treatment of seeds by solutions of bioregulators, leaf feeding, and the introduction of immunizers directly into the plant. These bioregulators, as secondary metabolites of the higher plants, do not have cyto- or phytotoxicity, which is of especial importance at the present time in connection with the increasing danger of environmental pollution.

The method of chemical immunization of seeds by moistening them immediately before planting in a solution of one or another bioregulator (the latter are species- and variety-specific) is most promising. The seedlings obtained from the treated seeds survive better after replanting in the field, are more hardy, have a well-developed root system, and are distinguished by an accelerated transition from one phenological phase to another. The germinating capacity and the energy of the germination of the seeds are substantially enhanced. All this makes it possible to obtain an increment in the yield of up to 30 percent. The economic effect, including that gained through the decrease in the time for the preparation of the seedlings for transplantation into soil and savings in fuel resources, is 800-900 rubles/hectare for open ground tomatoes, 1000 rubles/hectare for peppers and eggplants, and 400-500 rubles/hectare for sugar and fodder beets. Still greater prospects have opened up through the use of bioregulators in glass-covered ground: 10,000 rubles/hectare for cucumbers; and from 17,000-50,000 rubles/hectare for tomatoes (depending upon variety).

A visual phytopathological assessment of the degree of a complex of diseases was carried out in 1981-1983, using a standard five-point assessment scale. As the result of the application of bioregulators 1, 2, and 3 (provisional numbering) as chemical immunizers, the degree of infestation of tomatoes with macrosporiosis decreased in 1982 by 62 percent on the average; with bacterial black spot by 60; with wilt diseases, by 48; and with mosaic, by 60 percent. The degree of infestation with macrosporiosis decrease in 1983 by 32 percent; with bacterial black spot by 54; with wilt diseases, by 42; and with mosaic, by 49 percent. Thus, the bioregulators, by stimulating protective mechanisms, promote the enhancement of the integrated resistance of plants, which in its turn leads to a substantial increase in the yield of the treated plants. The yield of tomatoes rose by 17-37 percent on the average in 1981 as the result of the application of the preparations. The use of bioregulator 1 increased the yield of tomatoes by 36 percent; of bioregulator 2, by 41; and of bioregulator 3, by 38 percent in 1982.

In 1983, despite unfavorable natural conditions, the yield of tomatoes rose by 11 percent following the application of bioregulator 1; by 31, following the application of bioregulator 2; and by 30 percent following the application of bioregulator 3.

Bioregulator 2 promoted an increase in the yield by 25 percent under industrial conditions. Comparative data obtained in the process of the introduction of bioregulators in various regions of the country in 1986-1988 are presented in Table 1.

Table 1.

Region, enterprise	Bioregulator	Crop, growing conditions	Yield	
			experiment	control
Primore Kray, "Dalnevostochniy" sovkhoz	1	Cucumbers (glass-covered ground)	29 kg/m <sup>2</sup>	27 kg/m <sup>2</sup>
Yakutsk ASSR, "Oktemskiy" sovkhoz	1	the same	15.6 kg/m <sup>2</sup>	10.4 kg/m <sup>2</sup>
Moldavian SSR, "Teplichniy" sovkhoz	1	"	20.1 kg/m <sup>2</sup>	19.0 kg/m <sup>2</sup>
Moldavian SSR, Lenin sovkhoz	2	Tomatoes (open ground)	813.6 centner/ha	367 centner/ha
Lithuania, Vilnius hothouse combine	2	Tomatoes (glass-covered ground)	24.7 kg/m <sup>2</sup>	22.6 kg/m <sup>2</sup>
Ukrainian SSR, Kharkov hothouse combine	2	Tomatoes (seedling)	582 centner/ha	528 centner/ha
Moldavian SSR, Tiraspol, "Dnestr" SPA [NPO]	2	Tomatoes (glass-covered ground)	26.6 kg/m <sup>2</sup>	20.3 kg/m <sup>2</sup>
The same	3	"	27.2 kg/m <sup>2</sup>	20.3 kg/m <sup>2</sup>

In addition to the pre-planting moistening of the seeds, the new preparations have also been used for the leaf treatment of vegetable and truck garden crops during flowering or at the seedling stage. Thus, the sprinkling of tomatoes as the flowering of the plants proceeded made it possible to increase the yield up to 60 percent. The treatment of apple trees of the Golden Delicious variety with bioregulator 4 led to an increase in yield of 25-30 percent on the average.

The use of these agents on sugar beets by the seed incrustation technique not only enhances the resistance of the plants to diseases and the yield, but also increases the sugar content of the root crop.

Positive results have also been obtained from bioregulators in a multitude of cereal, technical, pharmaceutical, floral-decorative, and timber crops in various agroecological zones.

It has been possible to identify membrane-active properties of the bioregulators in the process of their operation, thanks to which properties the possibility of their use in combination with pesticides has opened up. The possibility of the reduction of the number of treatments with chemical agents, that is, of the reduction of pesticide pressure, has opened up as the result of the increase in the permeability of the cell membranes induced through the use of bioregulators.

At the present time preparations based on the bioregulators are passing through multilevel, broad-based trials and introduction not only in the territory of Moldavia, but also in other climatic zones of the USSR and abroad, in Hungary, Bulgaria, Yugoslavia, and India, in various agricultural crops. © COPYRIGHT: VO "Agropromizdat", Zashchita rasteniy, 1991



### Use of an IAG Laser for Removing From a Bronchus a Foreign Body Present for Many Years

917C0441A Moscow GRUDNAYA I SERDECHNO-SOSUDISTAYA KHIRURGIYA in Russian No 1, Jan 91 (manuscript received 11 Jun 90) p 53

[Article by P. P. Shipulin, Yu. G. Tkach, and S. D. Polyak (Chair of Surgical Diseases No 1 (Prof A. P. Dotsenko, director), Odessa Medical Institute imeni N. I. Pirogov, Odessa Oblast Clinical Hospital: "Use of an IAG Laser for Removing From a Bronchus a Foreign Body Present for Many Years"]

UDC 616.233-003.6-089:615.849.19

[Text] Foreign bodies present in the respiratory tract for a long time are usually covered with excessive granulations, and their endoscopic removal presents great difficulties. We are reporting the observation of the successful removal from a bronchus of a foreign body present for many years.

The patient P., a 36-year-old female, came to the clinic on 4 Oct 89 with complaints of cough with the production of purulent sputum, fever, and general weakness. From the medical history it was established that 16 years previously a walnut shell had entered the respiratory tract; since that time she has frequently suffered from pneumonias. She has been repeatedly examined and treated by a phthisiologist. Upon admittance her condition was satisfactory. The body frame was correct, and the peripheral lymph nodes were not enlarged. Breathing in the lower sections of the right lung was weakened with a mass of dry and moist crepitations. On scanning and lateral chest x-rays there was nonhomogeneous infiltration of the middle and lower lobes of the right lung. Fiberbronchoscopy showed that the lumen of the segmented bronchus was sharply constricted because of the growth of pink tissues bleeding during contact with the endoscopic tube; a large amount of blood and purulent sputum was brought up from the bronchus. After their aspiration, a foreign body (walnut shell) was observed which was firmly attached to the bronchus. It did not seem possible to remove it by means of a flexible bronchoscope. It was decided to attempt endoscopic removal of it by means of a rigid bronchoscope under general anesthesia. On 9 Oct, bronchoscopy with a Friedel endoscope was performed under anesthesia. Attempts to take out the foreign body with forceps produced bleeding from granulations.

A telescopic optical device, 5 mm in diameter with a 180° angle of vision, was introduced into the segmented bronchus; attached to it was a laser quartz monofiber wave-beam guide enclosed in a Teflon catheter. The excess granulations and hemostasis were photocoagulated by means of impulse radiation of a neodymium IAG laser. The output power was up to 40 V with a density of 8.8.16<sup>6</sup>

V/cm<sup>2</sup>. Photocoagulation was performed with short impulses lasting 0.5-1 second. After destruction of the excess granulations, the foreign body was successfully seized with biopsy forceps and removed. The size of the walnut shell removed was 3 x 1.5 cm. The remaining granulations were laser photocoagulated, and the secretion was aspirated. The lumen of the segmented, lower, and middle lobe bronchi was reduced completely. Later several sanitizing fiberbronchoscopies were performed on the patient, and in a satisfactory condition she was ordered ambulatory care. Her condition was completely satisfactory in a control examination on 3 Apr 90, and no complaints were manifested. A chest x-ray showed that the lung field was transparent, without focal and diffuse infiltrative changes. Fiberbronchoscopy showed lumina of the segmented, lower, and middle lobe bronchi to be freely permeable, granulations were absent, and moderately manifested were edema and hyperemia of the mucous, and also smoothing of the cartilaginous picture in the segmented bronchus.

The present observation confirms the possibility of successful endoscopic removal from a bronchus of a foreign body present for many years by using laser photocoagulation of excess granulations with an IAG laser for the purposes of preventing intrabroncheal bleeding.

### Laser Therapy of Arrhythmia

917C0471A Moscow KARDIOLOGIYA in Russian Vol 30 No 12, Dec 90 (manuscript received 27 Sep 89) pp 76-79

[Article by V. A. Bobrov and V. N. Zaleskiy, Clinical Department of Cardiac Arrhythmia, Kiev Scientific Research Institute of Cardiology imeni N. D. Strazhesko]

[Abstract] A brief review is presented of largely Western literature on experiments and trials with laser therapy in various forms of arrhythmia. The review delineates the various gas and solid lasers that have been employed, using fiber optics for targeting purposes. More recent advances include studies with excimers and more efficient optical fibers made from silver halides. In general, the preliminary findings are encouraging. Argon lasers have been used successfully for endocardial coagulations (ablations) and ventriculotomies, while Nd-YAG lasers have corrected atrial fibrillations refractory to drug therapy. In the intravascular state laser action is affected by blood which amplifies the size of induced lesions. Histopathologic examinations have shown that the immediate target site is evaporated, while adjacent tissues are subject to thermal denaturation, coagulation, and even charring and possible crate formation. Side effects may include electrophysiologic sequelae and laser-induced ventricular fibrillations have been reported. Future developments will depend on availability of improved stable generators and improved optical fibers for better targeting of laser beams. References 62: 13 Russian, 49 Western.

**Comparative Analysis of Effect on Bees of  
Low-Frequency Electric Field and Physical  
Factors Accompanying It**

*917C0315 Sverdlovsk EKOLOGIYA in Russian No 6,  
Nov-Dec 90 (manuscript received 7 May 88) pp 81-84*

[Article by Ye. K. Yeskov and G. A. Mironov; Ryazan  
Pedagogical Institute imeni S. A. Yesenin]

UDC 595.799.591

[Abstract] A study of the effect on bees of physical factors accompanying an electric field and the reaction of bees to a permanent electric field involved honey bees kept in standard hives or entomological breeding areas. Change of sounds generated by the bees in response to the effect of the electric field and change of temperature in the hive indicated the reaction of bee

families to the electric field. The study included determination of the effect of low-frequency (500 Hz) electric fields, effect of a permanent electric field, effect of ionization, vibrations of walls of the hive in a low-frequency electric field and the effect of a magnetic field on bee behavior. A frequency of 500 Hz and field intensity of 40-60 V/cm increased motor activity and aggressiveness of worker bees. Intensity of bee sounds increased with voltage increase and temperature in the hive increased simultaneously. Motor activity of bees kept in a breeding area increased with increase of voltage and peaked at 130-179 V/cm. Further voltage increase decreased motor activity somewhat. Significant increase of ions concentration in the hive did not significantly change the intensity of sounds nor the temperature in the hive. The bees did not react to a magnetic field. The factors studied were unrelated to known forms of reaction of bees to an electric field. Figures 1; references 8: 6 Russian, 2 Western.

**Pharmacological Correction of Visual Function**

917C0626 Odessa OFTALMOLOGICHESKIY  
ZHURNAL in Russian No 5, 1990 (manuscript  
submitted 22 Mar 88) pp 305-309

[Article by V. V. Kovalenko, Ukrainian Scientific  
Research Institute of Prostheses, Prosthesis-Making, and  
Evaluation and Restoration of Ability to Work, Kharkov]

UDC 617.7-085:615.4(048.8)

[Text] The search for means of pharmacologically correcting fatigue and raising efficiency in the individual via various medicinal preparations is one of today's pressing problems. The solution to that problem, however, is nowhere near a final stage, despite the enormous amount of experimental data that has been collected.<sup>31</sup>

Attempts have also been made to produce pharmacological effects on the human visual apparatus for the purpose of correcting a disruption of function<sup>15,19,36</sup> and for the purpose of stimulating function in the performance of work.<sup>27</sup>

The literature contains information on the use of stimulants from plant sources (such as ginseng, eleutherococcus, golden root, *Leuzea*, and *Echinopanax elatum* Nakai L.)—so-called adaptogens—for raising visual efficiency. According to I. I. Brekhman's data,<sup>3</sup> peroral ingestion of eleutherococcus produces a substantial increase in visual acuity, which reaches a maximum by the eighth hour after ingestion of the preparation and holds there for 32 hours. Ginseng has the same effect.<sup>10</sup> Perm researchers<sup>24</sup> have found that a single ingestion of 2 ml of eleutherococcus raises the speed and magnitude of dark adaptation by 30 percent and lowers the fatigue index by 20 percent. Based on that, the authors recommend that individuals who do high-precision work take 2 ml eleutherococcus daily before lunch for two months twice a year (in March and April and in November and December). Acceleration of the process of dark adaptation as a result of the ingestion of ginseng, eleutherococcus, and *Schizandra chinensis* L. has also been demonstrated by a number of researchers from the Far East.<sup>17,26,29,37,38</sup> Data exist on the improvement of the color perception of the eye by biogenic stimulants.<sup>32</sup>

The effect of adaptogens is demonstrated in normal conditions as well as against the backdrop of various damaging actions, which, in theory, is employed for eliminating phenomena associated with excessive fatigue.<sup>31</sup> The possibilities for clinical use are feasible, and the effect develops gradually with long-term use.<sup>3-5,12,25</sup> Care, however, should be taken, as recent research<sup>41</sup> describes certain adverse effects accompanying long-term use of the preparations (a withdrawal syndrome, for example, associated with long-term ingestion of ginseng). The causes of such phenomena are not quite clear. Apparently, however, the ingestion of adaptogens of plant origin should be done under the supervision of a physician.<sup>31</sup>

The effect on the visual apparatus produced by psychotropic drugs that normalize the mental activity of the individual has also been studied.<sup>6,11,18,23,35</sup> The frequency

of their use is known to have grown in recent years, something that is typical of most highly developed countries of the world.

As it turns out, those drugs are far from indifferent to the visual organ. The most sensitive to their effects are the accommodative capacity of the eye, intraocular pressure, intraocular hemodynamics, and color perception. Neuroleptics, tranquilizers, antidepressants, normoleptics, and psychodysleptics produce different functional disturbances in the visual analyzer and can even serve as the cause of severe pathology (such as retrobulbar neuritis, retinal damage, and lens damage); transitory myopia is also possible. Counter to that, the psychostimulators would seem to have no negative effect on visual function and even enhance the processes of excitation and accelerate impulses in the central section of the visual analyzer.

At the same time, in an experiment involving cats, it was shown that phenamin, catinon, and sidnocarb sharply suppress the reflex for the perception of visual signals, which is completely restored after the effect of the drugs end.<sup>20</sup> That phenomenon is attributed to the loss of the ability to perceive the information value of incoming visual signals as a result of the disruption of processes that check them against information stored in long-term memory. Such a possibility is all the more probable since all the indicated drugs produce an excitatory effect on the reticular formation, which in turn monitors the output of information stored in memory, that is, the reproduction of engrams. Thus, those substances can affect the reproduction of time relationships. Cocaine, on the other hand, unlike the drugs enumerated above, does not disturb visual perception. Such data are in agreement with data that indicate that cocaine and phenamin have a different effect on processes of learning and consolidation in the development of an avoidance response.<sup>39</sup>

The promise held by the use of pharmaceuticals for the treatment and prevention of progressive visual fatigue has been analyzed in detail by V. M. Vinogradov.<sup>8</sup> He evaluated the problem from two standpoints: (a) controlling the general asthenization of the body and disruptions of the central regulation of the tonus and contractility of the eye muscles, and (b) the possibility of producing a direct effect on those muscles when they are excessively strained or when they evidence gradual development of chronic fatigue and accompanying local biochemical and functional changes. Formulating requirements for the "ideal" means of treating asthenopic conditions, Vinogradov singles out the following as the main requirements:

- (a) the possibility of a simultaneous therapeutic effect on asthenia-related changes in the central and peripheral mechanisms of accommodation
- (b) the possibility of long-term enteral and/or local application, without toxic or side effects produced by followup courses lasting at least 3-4 weeks; long-lasting, consistent effect enabling 1-2 doses per day

- (c) the absence of direct excitatory or inhibiting effect on the ciliary muscle and iris muscles, and absence of irritating effect and ability to change intraocular pressure.

The last two requirements virtually exclude pharmacological correction of asthenopia with the conventional drugs for the treatment of asthenic conditions—stimulants and antidepressants (such as phenamin-like substances, MAO inhibitors, and tricyclic antidepressants) that have pronounced vegetotropic properties, an undesirable total effect, and multiple side effects. Holding some promise is the study of new nootropic preparations (such as piracetam, debrumil, and tonibral), as well as by antihypoxia agents that improve the energy status of cells. It is the "metabolic" correction of asthenopia that is the most promising today.

Antihypoxia agents are substances that increase the body's resistance to oxygen insufficiency. One such agent that is effective in various forms of hypoxia, including circulatory hypoxia, is sodium hydroxybutyrate.<sup>7,22,28,34</sup> The special position it occupies among the antihypoxia agents stems from the fact that  $\gamma$ -hydroxybutyric acid, the sodium salt of which is the agent itself, is a member of the "GABA shunt," which is one of the alternate metabolic routes of the Krebs cycle. That gives  $\gamma$ -hydroxybutyric acid the ability to normalize indices of the energy process—specifically, to activate cytochromoxidase<sup>33</sup> and to prevent the buildup in tissue of toxic end-products of the oxygen<sup>21</sup> nitrogen<sup>14</sup> metabolism. The retina, however, contains high concentrations of GABA, which is especially true of the ganglionic and amacrine cells.<sup>40</sup> The ability of sodium hydroxybutyrate, ingested over the long term, to produce changes in the histological indices of the retina that indicate elevated activity of its oxidative enzymes has been demonstrated in experiment.<sup>13</sup>

V. M. Vinogradov<sup>8</sup> substantiated the use of the antihypoxia agent gutimine and its derivatives for stimulating the visual apparatus. He emphasized the following main points:

- 1. The principal effect of such substances is at the general cellular level, not at the regulatory level. Neural regulation of visual function is improved with their use only inasmuch as the nerve system also consists of cells; at the same time, local application directly improves the work of fatigued muscles. Preparations of this type have a neutral effect on mediators and their receptors, and because of that, they don't produce any changes in accommodation or intraocular pressure.
- 2. The basis of the local and central antiasthenia action of preparations such as gutimine is the restoration of the energy balance of chronically fatigued, depleted cells. The preparations lower the oxygen consumption of tissue and of the entire body in a resting state, without hindering the mobilization of oxidative processes in periods of greater work. The same volume of exertion is performed more economically in terms of energy, and after functional overexertion, restoration of the body's (or the organ's) efficiency is accelerated.

- 3. The preparations raise the resistance of the body to a broad range of pathological effects and help to maintain neural regulation and mental status in extreme conditions. That also applies to the visual apparatus. The preparations have low toxicity and can be prescribed for fairly long followup courses.

The practical use of gutimine derivatives (gutimine pyruvate) in the treatment of weakness of the ciliary muscle characterized by reduced visual acuity, accommodation disorders, and asthenopic complaints has had a positive effect for up to three months. Combining a medicinal with orthoptic exercises has extended the clinical effect to up to a year.<sup>16</sup> The fact that the use of gutimine (glutamine) has, according to the data of Kolesnikova and Losev, helped to improve accommodation and convergence in individuals who complain of having difficulties with close work enables one to assume that it could possibly be used for treatment-prevention purposes by individuals who do high-precision work or for the initial stages of presbyopia.

Also among the favorable qualities of gutimine is its antiaggregation action—it helps restore the structure of the formed elements of the blood damaged in tissue hypoxia and has a positive effect on the condition of vascular walls.<sup>2,30</sup>

In the opinion of V. M. Vinogradov,<sup>8</sup> the use of antihypoxia agents that have a whole-body/local preventive and therapeutic antiasthenia effect opens new possibilities for "metabolic" therapy for asthenic conditions. Rather than preclude simultaneous prescription of energy substrates (glutamine, succinate, glycerophosphate, etc.) and macroerg precursors (riboxin), such agents make it advisable.

The new angle of approach spelled out here to the solution of the problem seems very promising to us. From those standpoints, we would seem to need a revision of the practice established in the last few decades of using vegetotropic substances for the treatment of myopia, accommodative spasm, and weak accommodation—cholinomimetics (pilocarpin) and anticholinesterase agents (ezerin or fizostigmin), as well as adrenomimetics and agents similar to them (adrenalin, ephedrin, mesaton).

The advisability of strengthening close-up accommodation with guanidine derivatives (5 percent solution of hemedin [gemedin]) for the purpose of raising the visual efficiency of operators is doubtful.<sup>9</sup>

What merits further study is the possibility of using hormonal preparations for raising the efficiency of visual function (vasopressin and ACTH<sub>4-7</sub>) and for treating myopia (intermedin). It has been established that vasopressin and ACTH<sub>4-7</sub>, upon instillation in the nasal cavity, produce a quantitative improvement in visual perception, according to data of psychophysiological testing, of 15-20 percent and 30-35 percent, respectively.<sup>1</sup> Oligopeptides also decrease the time associated with the performance of the corrective test with Landolt rings, reduce the number of missed and incorrectly marked rings, have virtually no effect on involuntary ocular-image memory, and slightly accelerate the processes associated with restoration after visual fatigue.

In summarizing what has been said, we feel it advisable to note that the problem of pharmacological correction of visual function, which has a multitude of interesting and important aspects, merits further careful, comprehensive study. But the practical conclusions of this research should find sufficient application both in the clinic for eye diseases and in the physiology of vision and work.

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### Three Books on Nystagmus, Vestibular Recruitment, and Automated Analysis of Vestibulosomatic and Vegetative Reactions

917C0666A Kiev ZHURNAL USHNYKH, NOSOVYKH I GORLOVYKH BOLEZNEY, in Russian No 2, Mar-Apr 91 (manuscript received 5 Feb 91) pp 89-92

[Review by Prof. V. G. Bazarov, Honored Scientist and Technologist, of books *Nistagm (Nystagmus)*, by I. A. Sklyut and S. G. Tsemakhov, Vysheysh. shk., Minsk, 1990, p 240; *Vestibulyarnyy rekrutment (Vestibular Recruitment)* by I. A. Sklyut and S. G. Tsemakhov, Nauka i tekhnika, Minsk, 1990, p 92; (*Automated Analysis of Vestibulosomatic and Vegetative Reactions*) by I. Sklyut, V. Pivrikas, and A. Zhukauskas, Mokslas, Vilnyus, 1990, p 180]

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[Text] Three monographs appeared in 1990, written by a collective of authors under the direction of Prof. I. A. Sklyut. All are devoted to the problem of clinical vestibulology.

The book "Nystagmus" opens this series of studies and consists of three parts. The first, "Introduction to Clinical Nystagmology", contains a description of the mechanisms of vestibular nystagmus, which the authors divide into labyrinthine, labyrinthine-nuclear, efferent, nuclear, vestibulo-oculomotor, cerebellar, and cortical. The description of the reflex arc of vestibular nystagmus in the literature is often cited; however, in the present work it is presented in close connection with the systems which exert a regulatory influence on it; the detailed exposition of the efferent mechanisms of nystagmus seems particularly important. This morphofunctional approach to the description of the reflex arc of vestibular nystagmus should substantially facilitate the interpretation of clinical findings, and overall promote the introduction of new theoretical and applied knowledge into clinical practice.

The description of the different forms of spontaneous nystagmic activity in healthy persons whom the otolaryngologist may encounter is of practical significance. Alcoholic nystagmus, the fixational congenital nystagmus of the blind, and voluntary nystagmus may be included here. These forms are considered for the first time in the Soviet literature in exhaustive completeness, and are illustrated with electronystagmograms.

The authors, in describing these types of nystagmus, in many cases propose new ideas and views based on careful study and on an assessment of the data of electronystagmography (ENG). For example, the delineation of such a feature of congenital nystagmus as the constant variability of its structure under stable investigatory conditions is well done.

The information regarding the interaction of visual (congenital) and vestibular nystagmus and optokinetic nystagmus is important from the practical and theoretical point of view.

Original data on alcoholic nystagmus are contained in this section. The approach suggested by the authors to its

assessment makes it possible to a certain extent to determine the degree of alcoholic intoxication on the basis of the nystagmic reaction.

The important problem of the interpretation of the norm and the pathology of nystagmus is raised in this book, and the causes of the difficulties in the evaluation of the criteria of normal and pathological vestibular reactions are disclosed. A new idea, reinforced by illustrative and statistical data, is advanced, which persuades that the difficulties in the separation of the norm from pathology are built into the very nature of the vestibular system. In the opinion of the authors, this explains the futility of the attempts to find a way to develop a vestibular norm through the standardization of research methodology and the statistical analysis of nystagmus in large groups of patients. Such an effort, as is well known, has been carried out by a number of Soviet and foreign authors, but this has not led to a resolution of the problem.

The value of this section is increased by the fact that the authors suggest several original approaches which permit the delimitation of nystagmus in the norm and pathology. In these terms, the assessment of nystagmus by the method of comparison and determination of its dynamic indices, which are established on the basis of the increase in the magnitude of the parameters in response to the intensification of the stimulus, is of interest. The authors have succeeded through the use of special methods in discovering an important principle. It was found that the dynamic parameters have a substantially higher degree of constancy than the absolute parameters of nystagmus. In their opinion, the determination of the dynamic parameters of nystagmus offers a promising avenue to the resolution of the problem of vestibular norm and pathology.

Original data are presented on the clinical specificity of the parameters of nystagmus. It is demonstrated, in particular, for example, that it is more expedient to use the parameter of the frequency of nystagmus for the identification of vestibular recruitment, and its amplitude for the identification of habituation. These observations are practical interest.

The first part of the monograph concludes with the important conclusion that, in order to establish vestibular dysfunction, it is necessary to carry out the investigation of nystagmus with open and closed eyes under conditions of polymodal stimulation, i. e., in conditions approximating the study of the vestibulo-ocular interaction.

In the second part of the "Nystagmus" monograph, practical means of the investigation of spontaneous nystagmus and the nystagmus of position are described, information is presented regarding the caloric and rotational methods of the stimulation of the vestibular system, and the physiological essence of the stimulation of the labyrinths. It is noted that the caloric methods of the investigation of the vestibular system makes it possible to identify labyrinthine-nuclear reactions, and the rotational methods, the nuclear reactions. In this connection, recommendations

are offered for the appropriate clinical interpretation of the results of these tests, in particular, of nystagmus asymmetries detected by these methods.

The methodology is described and the so-called non-standard methods of the stimulation of the vestibular apparatus are analyzed: bithermal-bilateral stimulation, and threshold, graduated, conflictual, and sinusoidal caloric tests. The majority of these methods have been proposed and introduced into practice by the authors. It is demonstrated that their use significantly expands the possibilities for the identification of nystagmus asymmetries, the nystagmus reflex balancing reactions, and makes it possible to avoid errors which may be admitted when the usual means of the stimulation of the vestibular apparatus are utilized.

The most important of the sections of "Nystagmus" is its third part, "Problems of Clinical Nystagmology." The term "nystagmology" was advanced as early as 1915 by V. I. Voyachek. At that time it did not gain wide circulation. Among the various factors which held the development of nystagmology back, the principal was the absence of an adequate method of nystagmography. At that time there was no question of the clinical interpretation of its results.

The authors substantiate the use of the term "nystagmology" by the fact that they have been able to show how, by using ENG, it is possible to discover the finest nuances of change in the reaction of nystagmus in the various forms of impairment of the vestibular system.

The description of nystagmus at the various stages of disease in peripheral and central impairments of the vestibular system represents a substantial contribution to the working out of the problem of clinical vestibulometry.

Attempts to delineate various stages of the compensation of vestibular dysfunction have been undertaken by Pfaltz (C. R. Pfaltz, 1960) and other investigators. However, it must be acknowledged that the most significant result in this area has been achieved by the authors of the monograph under review here.

A special value of the work resides in the fact that a comprehensive analysis has been provided in it of the various types of nystagmus at various stages of disease, taking due account of its manifestation with open and closed eyes under the conditions of polymodal stimulation of the labyrinths. This permitted the authors to describe a number of previously unknown or poorly known features of the change in reactivity of the vestibular system.

The publication of the authors' second monograph, "Vestibular Recruitment", also deserves high praise. In audiology, as is well known, suprathreshold audiometry followed the threshold methods of the examination of hearing, making the significant expansion of diagnostic capabilities possible. In vestibulology, on the contrary, for a long time mainly suprathreshold methods of the examination of the vestibular system have been utilized. The

authors have shown that only the comparison of the suprathreshold and the threshold methods make it possible to evaluate the functioning of the vestibular apparatus fully.

When one has finished reading the monograph, "Vestibular Recruitment", an integral notion of the phenomenon of the balancing of vestibular excitability-vestibular recruitment and vestibular habituation, has taken shape. The balancing of vestibular excitability is a fragment of a certain kind in the chain of mechanisms of the compensation of the various forms<sup>1</sup> of vestibular dysfunction, and is considered by the authors in relation to its variants. The rich factual and graphic material of the book persuades the reader of the correctness of the interpretations proposed by the investigators.

The third monograph, devoted to the use of computer technology for the analysis of vestibulosomatic and vegetative reactions, concludes this labyrinthological trilogy which is responsive to the spirit of the times.

The first chapters of this original opus are devoted to pressing problems of contemporary nystagmometry. Having devoted many years to the study of vestibular nystagmus, the authors emphasize the surprising properties of this reflex, which distinguish it from other forms of reflex activity of the organism. They number among these the rhythmic manifestation of nystagmus, the prolonged development of the reflex, and its vectorial character. It is again emphasized (and this is very important) that the most complete representation of the state of the vestibular function can be obtained through the comparison of the data recorded by ENG with open and closed eyes. This methodological approach brings vestibulometry to the higher level of development of clinical nystagmometry. In the conclusion of the first chapter the authors formulate five principles which sufficiently fully characterize the contemporary level of development of clinical nystagmometry, and in fact point out the avenues along which this discipline will develop in the near future. The traditional methods of nystagmometry are examined in historical perspective, and a critical analysis of their merits and deficiencies is provided. Issues debated in relation to the diagnostic significance of the duration of experimental nystagmus are touched upon.

The stages of the introduction of computer technology for the assessment of vestibular and optokinetic nystagmus are presented in the monograph. This work began in Soviet otology at the end of the 1960s to the beginning of the 1970s. The huge computers of the "Dnepr" type were utilized initially for this purpose. Although when using the batch mode of operation they solved a number of problems of interest to physicians, they still, in the authors' opinion, had a number of inadequacies; in particular the results of the analysis were printed only at the end of the mathematical analysis of the entire batch, and did not allow the achievement of a direct interface between the physician and the computer. The authors then consider the methods



of processing ENG data on personal computers in real time. Here two trends are delineated: the first is the complete automated analysis of the ENG without the possibility of operator control using control digital mini-computers and the batch data processing mode; the second (which was developed in connection with the difficulties occurring in the identification of nystagmic cycles, blinking, voluntary eye movements, etc.) is the introduction of the method of interactive systems which permit the physician to actively control the process of inputting, accumulation, and analysis of ENG signals.

The authors describe in detail the schema of their own apparatus complex for the automation of the analysis of nystagmus on the basis of mini- and macrocomputers, the software and the test control, the methods of examination, the clinical analysis, the spectral analysis of the parameters of the ENG complex, and the algorithm for the determination of the characteristic points of the ENG signal. The operation of these complexes is illustrated by examples from practice.

The last chapter of the monograph is devoted to the automated analysis of vestibulo-vegetative reactions.

There are no fundamental adverse comments regarding these works.

The authors have made a major contribution to the solution of problems of clinical labyrinthology. Assessing the theoretical and practical significance of the trilogy still lies ahead. The books have been met with great interest by specialists.

### **The Isolation of Salmonellae From the Effluent Water of Infectious Disease Hospitals**

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[Article by B. R. Boboyeva, I. S. Molochayeva, D. Kh. Karimova; Tadzhik Scientific Research Institute [NII] of Epidemiology and Hygiene]

[Abstract] The difficulty of isolating pathogenic agents from the effluent water of infectious disease hospitals relates to the low sensitivity of techniques and the low content of pathogens in relation to the total bacterial count. The "mobile growth" technique and an elective medium developed by the Central Epidemiology Scientific Research Institute of the USSR Ministry of Health [TsNIIE MZ SSSR] for the detection of typhoid fever and paratyphoid agents from the excreta of patients were utilized to improve the detection of Salmonellae. This was compared with the traditional techniques. The effluent water was collected before and after purification, after settling tanks, and before entering the common collector. The partitioning of the samples was carried out using the gauze plug technique. Twenty-seven Salmonella strains were grown out by the "mobile growth" technique, as against eight by the usual technique; this applied to all serogroups, but especially to the rarer groups (14 out of 16 of which were grown out only by the new technique). The detections were made all along the sampling path. However, *Sh. flexneri* and *Sh. sonnei* were grown out only by the traditional method. Thus, there is an advantage in the specific search for Salmonellae, but this must be supplemented by traditional methods in the comprehensive search for enterobacteria. Tables 2; references 2.

**Infectious Morbidity in the USSR: Structure, Levels, Dynamics and Economic Importance**  
917C0474A Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian  
Vol 111 No 12, Dec 90 pp 30-34

[Article by I. L. Shakhnina and T. P. Chernova, Central Scientific Research Institute of Epidemiology, USSR Ministry of Health]

UDC 616.9:313.13(47+57)

[Text] A knowledge of the present epidemiologic situation in relation to all infectious pathology is a prerequisite of well-grounded strategic decisions concerning control of infectious diseases. One of the main indicators characterizing this situation is morbidity, an analysis of which is undertaken in this paper.

**Materials and Methods**

Infectious pathology is examined in relation to all diseases and to groups of diseases, as recorded on Form No 85 (Infection), for 1974-1988 as a whole. Infectious pathology is also examined in its dynamics over five-year periods—1974-1978, 1979-1983 and 1984-1988. Known statistical methods of epidemiological analysis of the structure, levels and dynamics of morbidity were used to process the data. Processing was carried out on an IBM PC XT computer with "Supercalc-4" software. A quick method was used to calculate economic importance [1].

**Results and Discussion**

According to data for 1974-1988, each year an average of 69 million cases of infectious diseases are recorded in the USSR, which is 25,746 per 100,000 of the country's inhabitants. These indicators grew continuously in the period under examination: 60.6 million and 23,626 in the first five-year period (1974-1978), 67.4 million and 25,224 in the second (1979-1983), and 80.2 million and 28,669 respectively in the third (1984-1988).

The sum total of infectious pathology is known to consist of a large number of independent nosological forms, among which influenza and ORVI [viral ear, nose and throat infections] occupy the dominant place—an average of 91.4 percent for the period. When we exclude influenza and ORVI from all infections, we find first of all that over an average of 15 years, the number of other infectious diseases totals 5.9 million cases and 2,201 per 100,000 population annually, and secondly that these indicators are practically stable (5.8 million and 2,247 in the first five-year period, 6.6 million and 2,486 in the second, and 5.8 million and 2,084 in the third).

Intestinal and airborne-droplet infections determine 99.8 percent of the structure of other infectious diseases, with the latter prevailing somewhat (Table 1). During the period in question acute intestinal infections (AII) of established and unestablished etiology, shigellosis and viral hepatitis (VH), which make up over 95 percent of illnesses in this group, basically dominated the intestinal infections group. Among the airborne-droplet infections,

five nosological forms—chicken pox, epidemic parotiditis (EP), measles [kor], German measles [krasnukha] and scarlet fever—make up more than 98 percent of the group's structure, with half of all cases being represented by chicken pox (51 percent).

**Table 1. Structure of Infectious Morbidity in the USSR in 1974-1988 (Not Counting Influenza and ORVI)**

Nosological Forms	Proportion of Diseases, Percent of Total		
	1974-1978	1979-1983	1984-1988
Typhoid fever	0.28	0.20	0.18
Paratyphoid	0.11	0.06	0.07
Other salmonellosis	1.57	1.57	1.60
Shigellosis	19.02	9.50	9.88
GEC of established etiology	2.36	8.24	4.16
AII of unestablished etiology	14.02	13.61	14.85
VH	11.11	13.61	14.55
Including:			
VH A	10.36	12.62	12.67
VH B	0.75	0.99	1.88
Yersiniosis	-	-	0.30
Brucellosis	0.06	0.06	0.09
Poliomyelitis	0.00	0.00	0.00
Leptospirosis	0.01	0.02	0.03
Total for group	48.54	46.87	45.71
Diphtheria	0.00	0.01	0.02
Whooping cough	0.41	0.34	0.56
Scarlet fever	5.70	4.28	4.94
Measles	7.43	5.36	3.59
German measles	0	5.94	9.98
Meningococcal infection	0.27	0.26	0.30
EP	15.40	14.66	6.96
Chicken pox	22.08	22.13	27.69
Total for group	51.29	52.98	54.04
Total for blood infection group	0.15	0.14	0.24
Total for skin infection group	0.02	0.01	0.01
Total	100.0	100.0	100.0

A typical feature of infectious pathology (not including influenza and ORVI) is dominance of infections of viral etiology, the proportion of which increased in the period in question from 56.1 to 62.8 percent (3.7-4.1 million cases). Primary among these infections during the years in question are chicken pox (39-44 percent of all viral infections), VH (19-23 percent), German measles (9-15 percent), EP (27-11 percent) and measles (13-5 percent). In this case the proportion of "controllable" infections (measles, EP)

decreases over this period, while "uncontrollable" infections correspondingly grow. The role of viral infections becomes even more obvious if we take account of influenza and ORVI cases (60.7-74.4 million).

Infectious diseases of nonviral etiology, which make up 43.9-37.2 percent (2.1-2.5 million cases) of total infections not including influenza and ORVI, are represented to a level of 95.3-97 percent by shigellosis (43-27 percent), AII of established and unestablished etiology (37-51 percent), other salmonellosis (4 percent) and scarlet fever (13 percent).

Infectious diseases registered on USSR territory differ in their degree of occurrence in the population (Table 2). Five groups can be conditionally distinguished (1984-1988) [2].

1. Those of greatest occurrence (more than 1,000 cases per 100,000 population—influenza and ORVI).

2. Widely occurring (more than 100 cases per 100,000 population—VH A, shigellosis, AII of unestablished etiology, scarlet fever, German measles, EP, chicken pox).

3. Frequently encountered (from 10 to 100 cases per 100,000 population—other salmonellosis, gastroenterocolitis (GEC) of established etiology, VH B, whooping cough, measles).

4. Occurring relatively rarely (from 1 to 10 cases per 100,000 population—typhoid fever, paratyphoid, yersiniosis, brucellosis, meningococcal infection, tick-borne encephalitis, hemorrhagic fever).

5. Rarely encountered (up to 1 case per 100,000 population—poliomyelitis, leptospirosis, diphtheria, tularemia, rickettsiosis, malaria, anthrax, tetanus, rabies).

**Table 2. Indicators of Infectious Morbidity in the USSR in 1974-1988 (Per 100,000 Population)**

Nosological Forms	Morbidity Indicators		
	1974-1979	1979-1983	1984-1988
Typhoid fever	6.2	5.0	3.8
Paratyphoid	2.5	1.6	1.5
Other salmonellosis	36.2	39.1	33.3
Shigellosis	427.6	236.0	205.9
GEC of established etiology	53.1	204.8	86.6
AII of unestablished etiology	315.0	338.2	309.3
VH	249.7	338.4	303.1
Including:			
VH A	233.0	313.7	264.0
VH B	16.7	24.7	39.1
Yersiniosis	-	-	6.3
Brucellosis	1.2	1.4	1.9
Poliomyelitis	0.06	0.08	0.05
Leptospirosis	0.3	0.5	0.6
Diphtheria	0.1	0.3	0.4

Whooping cough	9.2	8.4	11.7
Scarlet fever	128.2	106.4	103.1
Measles	167.1	133.4	74.7
German measles	-	146.7	207.9
Meningococcal infection	6.1	6.4	6.2
EP	346.1	364.4	145.2
Chicken pox	495.9	550.1	576.9
Tularemia	0.08	0.11	0.08
Tick-borne encephalitis	0.8	0.9	1.2
Hemorrhagic fever	1.1	1.0	2.3
Rickettsiosis	1.2	0.9	0.7
Malaria	0.2	0.5	0.8
Anthrax	0.16	0.11	0.08
Tetanus	0.17	0.13	0.09
Rabies	0.16	0.03	0.02
Total not counting influenza and ORVI	2247.9	2485.9	2083.7
Influenza	4267.9	2952.1	4045.8
ORVI	17110.4	19786.3	22539.3
Total including influenza and ORVI	23625.7	25224.3	28668.8

The larger part of infectious diseases occupies a stable position in the group in the course of the period under analysis. The degree of occurrence of some diseases varies over time, which as a rule is the result of effective control of infectious morbidity. Thus, measles and GEC of established etiology shifted from the widely occurring group (1974-1978) to the frequently encountered group (1984-1988), while rickettsiosis shifted from the relatively rarely occurring group to the rarely encountered group. At the same time whooping cough moved from the fourth to the third group, while tick-borne encephalitis moved from the fifth to the fourth group.

An analysis of average annual growth rates can provide a more-detailed impression of the dynamics of the morbidity of specific infectious diseases.

In the period in question as a whole (1974-1988), decreases in morbidity occurred for typhoid fever (-5.1 percent), paratyphoid (-5.8 percent), shigellosis (-9.1 percent), AII of unestablished etiology (-0.5 percent), scarlet fever (-2.2 percent), measles (-7.1 percent), EP (-7.4 percent), meningococcal infection (-0.2 percent) and influenza (-1.9 percent), with the decline being the most stable (over three five-year periods) in regard to typhoid fever, shigellosis and EP. Growth of morbidity was noted in relation to other salmonellosis (+0.3 percent), GEC of established etiology (+4.9 percent), VH A (+1.2 percent), VH B (+9.4 percent), diphtheria (+20.5 percent), whooping cough (+2.0 percent), German measles (+5.6 percent since 1979), chicken pox (+1.5 percent) and ORVI (+2.7 percent). Special emphasis should be laid on the fact that the increase in morbidity for GEC of established etiology and

for VH B was continuous over the three five-year periods. In recent years (1984-1988) a tendency for the occurrence of VH A, chicken pox and ORVI to decrease and for occurrence of AII of an established etiology and whooping cough to increase was noted.

The economic importance of infectious pathology also deserves attention. Growth of the economic loss inflicted by infectious morbidity upon the national economy can be noted in the period under analysis (Table 3). For example, according to average data it was 5.9 billion rubles annually in the first five-year period, R7.4 billion in the second, and R10.8 billion in the third. Influenza and ORVI morbidity is the most significant in forming the economic loss (80-89 percent, or R5.3-9.5 billion). This situation is basically the consequence of growth of the average weighted economic loss per case of illness. In the 15 years in question, the increase in loss due to influenza, ORVI, chicken pox and EP was the most significant (an increase of 4.5 times). These indicators increased by three to four times for whooping cough, measles and scarlet fever, and by two to three times for typhoid fever, VH and meningococcal infection. Growth was least for GEC and anthrax—1.8 times, and for dysentery—1.2 times.

**Table 3. Economic Importance of Infectious Morbidity in the USSR in 1974-1988**

Nosological Forms	Economic Loss, Million Rubles		
	1974-1978	1979-1983	1984-1988
Typhoid fever	7.5	11.9	10.1
Paratyphoid	3.1	3.8	4.0
Other salmonellosis	28.8	37.4	24.4
Shigellosis	212.9	122.9	137.7
Including:			
Flexner's dysentery	-	-	49.3
Zonne's dysentery	-	-	47.8
GEC of established etiology	12.0	126.3	38.8
AII of unestablished etiology	71.2	208.7	138.4
VH	223.0	785.3	618.9
Including:			
VH A	-	-	488.0
VH B	-	-	130.9
Brucellosis	1.8	2.9	3.9
Total for group	560.3	1299.2	976.2
Diphtheria	0.05	0.5	0.6
Whooping cough	0.9	1.4	3.9
Scarlet fever	9.9	26.4	34.3
Measles	18.0	24.9	30.9
German measles	-	22.5	73.9
Meningococcal infection	2.8	7.1	8.7
EP	25.8	69.1	52.8

Chicken pox	25.4	76.4	146.8
Total for group	82.8	228.3	351.9
Anthrax	0.2	0.2	0.2
Rabies	0.06	0.01	0.01
Total not counting influenza and ORVI	643.4	1527.7	1328.3
Influenza	1051.6	756.9	1448.6
ORVI	4215.9	5073.3	8070.5
Total including influenza and ORVI	5910.9	7357.9	10847.4

**Table 4. Structure of the Economic Loss Inflicted by Infectious Morbidity in the USSR in 1974-1988 (Not Counting Influenza and ORVI)**

Nosological Forms	Economic Loss, Percent of Total		
	1974-1978	1979-1983	1984-1988
Typhoid fever	1.17	0.78	0.76
Paratyphoid	0.48	0.25	0.30
Other salmonellosis	4.47	2.45	1.84
Shigellosis	33.09	8.04	10.36
Including:			
Flexner's dysentery	-	-	3.71
Zonne's dysentery	-	-	3.59
GEC of established etiology	1.86	8.27	2.92
AII of unestablished etiology	11.06	13.66	10.42
VH	34.67	51.40	46.6
Including:			
VH A	-	-	36.3
VH B	-	-	9.68
Brucellosis	0.28	0.19	0.29
Total for group	87.08	85.04	73.49
Diphtheria	0.01	0.03	0.04
Whooping cough	0.14	0.09	0.29
Scarlet fever	1.53	1.73	2.58
Measles	2.80	1.63	2.33
German measles	-	1.47	5.56
Meningococcal infection	0.43	0.47	0.66
EP	4.00	4.52	3.97
Chicken pox	3.96	5.00	11.06
Total for group	12.88	14.94	26.49
Anthrax	0.03	0.02	0.01
Rabies	0.01	0.00	0.00
Total	100.0	100.0	100.0

Comparison of the structure of economic loss (Table 4) and morbidity (see Table 1) permits us to correct the impression which we obtained about the importance of individual nosological forms from just data on the occurrence of infectious diseases.

VH and chicken pox are the most graphic examples of such correction. According to data for the last five-year period, VH is 14.6 percent in the structure of morbidity and 46.6 percent in the structure of total economic loss (not counting influenza and ORVI); on the other hand chicken pox is a larger part of the morbidity structure (27.7 percent) than of the structure of economic loss (11.1 percent).

The relative economic importance of different infectious diseases was determined by ranking them in relation to the average annual loss inflicted by morbidity (1984-1988): VH (R619 million), all AII (314.9 million), chicken pox (146.8 million), German measles (73.9 million), EP (52.8 million), scarlet fever (34.3 million), measles (30.9 million), other salmonellosis infections (24.4 million), typhoid fever (10.0 million), meningococcal infection (8.7 million), paratyphoid (4.0 million), brucellosis (3.9 million), whooping cough (3.9 million), diphtheria (563,500), anthrax (186,000), rabies (13,000).

### Conclusions

1. The total amount of cases of infectious diseases (not counting influenza and ORVI) recorded in the USSR is practically stable (1974-1988), being an annual average of 5.9 million cases, or 2,201 per 100,000 population.
2. Diseases of viral etiology, the proportion of which has increased continuously in the last 15 years (from 56 to 63 percent), dominate the structure of infectious morbidity (not counting influenza and ORVI).
3. The most widely occurring diseases (per 100,000 population) are chicken pox (577), all AII (396), HV (303), shigellosis (206), German measles (208), EP (145), scarlet fever (103) and measles (75). These nosological forms make up 90 percent of the morbidity structure (not counting influenza and ORVI).
4. The total economic loss inflicted by infectious morbidity (1984-1988) averages R10.8 billion per year, with influenza and ORVI responsible for R9.5 billion and other diseases responsible for R1.3 billion.
5. Diseases causing the greatest loss to the economy include VH (R619 million in annual losses), all AII (R315 million), chicken pox (R147 million), German measles (R74 million) and EP (R53 million).

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### Kazakh Health Official on Priority Tasks of Public Health

917C0519A Alma-Ata ZDRAVOOKHRANENIYE  
KAZAKHSTANA in Russian No 3, Mar 91 pp 1-8

[Article by Kazakh SSR Minister of Health A. A. Amanbeyev: "Priority Tasks of the Republic's Public Health"]

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[Text] The program of the republic's government for transition to a market economy charted a firm course of gradual abandonment of the residual principle of financing public health. A deep, long look was taken at the problems of protecting the health of Kazakhstan's citizens, as a result of which new directions in the sector's development were defined. They include the economic, social and organizational transformations identified in 1990 at meetings of the Kazakh SSR Supreme Soviet. Basing itself on these decisions, the Kazakh SSR Ministry of Health developed a package of measures by which to reach the goal. Their implementation has now begun.

Elements of the new economic mechanism are being assimilated in the republic's medical institutions in the initial stage of the transition to insured medical care: Brigade forms of labor organization and the principles of internal cost accounting, leasing relations and the collective contract are being introduced. Over 800 day hospitals and 150 home-care hospitals have already been organized. Contracts are being signed more and more often with industrial enterprises and other organizations to provide extra health care to workers and their families.

Today's agenda calls for finding the most sensible ways to transfer the financing and maintenance of medical stations and polyclinics to the industrial, transportation and construction enterprises they service. We also need to work out a more efficient way of transferring paramedic-obstetric stations and rural medical institutions to the kolkhozes and sovkhozes.

Quite recently, there was much discussion concerning the suitability of creating medical cooperatives. Experience shows that cooperatives that strictly observe the principles of labor organization make a definite contribution to providing therapeutic and diagnostic care to the public. As of today, there are 114 cooperatives in our Ministry of Health. The volume of paid services they rendered in 1990 was over 50 million rubles.

The mean annual bed use rate has been decreasing everywhere in recent years. On the other hand many patients are not being provided prompt hospital care. This is why the Minister of Health drew up some recommendations on reviewing basic indicators such as the structure, recording and occurrence of disease. The first thing we need to do is to make an efficient analysis of the organization of therapeutic and preventive care. The distribution of the bed pool must be changed and the principles of its most sensible and advantageous use must be determined on the basis of dependable data. All of this will also shed some light on problems such as determining the demand for



personnel, financing and apparatus and revealing the volume of capital construction and medicinal support required, it will make it possible to identify the priority directions of medical science's development, and so on.

Preliminary calculations show that by establishing hospitals for follow-through treatment and rehabilitation and nursing care hospitals, and by opening new day hospitals, boarding hotels and homes for the aged and chronically ill, we can not only reduce treatment expenses by 2-2.5 times, but also noticeably upgrade the quality of treatment. The outpatient-polyclinic level is becoming the main link in the rural health care service, and improving the system of primary medical care is becoming the main principle of service. Today, the rural resident wants, and should receive, all forms of services at his place of residence, which creates the need for introducing new organizational forms and reconstructing the network of medical institutions. In this case primary care includes not only the purely professional aspects but also public health and epidemic control work and health education. Besides paramedic-obstetric stations and rural outpatient clinics, institutions of a new type are beginning to provide increasingly more active health care: health centers, polyclinic rehabilitation centers, combined medical-social centers for the elderly and senile, and other institutions intended to service population groups that are the least protected in social respects.

Even medical workers are not adequately supported and protected in social respects. This is precisely why the Kazakh SSR Minister of Health persistently and consistently implemented measures to introduce new wages for the sector's workers locally. Thus, last year physicians had a wage increase of 23 percent, middle-grade medical workers received a 50 percent increase, and executives were given a 25-38 percent increase.

The budget of the republic's public health system was R1,460,000,000 in 1990 (18 percent more than in 1989). Part of the additional assets were used to finance new institutions—hospitals with a capacity of 3,000 beds and polyclinics with the capacity of 7,000 visits per shift. Departments specializing in the pathology of pregnant women are now functioning in 15 oblast hospitals. A better way to provide such services would be to create centers for the protection of the mother and child in all oblasts. The service of medical genetics needs further development.

Creation of family outpatient clinics has justified itself. The qualitative indicators of their work are higher than for other forms of services to the public. Family outpatient clinics have now been opened in Alma-Ata, Chimkent, Kustanay and Ust-Kamenogorsk.

Organization of diagnostic centers is continuing. At the moment there are four of them in Kazakhstan. However, we cannot yet say that the work of these centers, which are furnished with expensive apparatus and equipment, is sensible and profitable. Today, these institutions are limited to only diagnosis (even their name is not entirely accurate, by the way), and they do not perform any

therapeutic and preventive functions. Reexamining their functions and purpose is a priority task in this connection.

There are significant difficulties in implementing the government program to improve the health of the population in 30 of the republic's socioeconomically-most backward rayons, and in the 46 rayons that are especially unfavorable with respect to tuberculosis. These complexities are primarily the product of problems in social and personal welfare. Nor is the personnel problem an easy one to solve. In order to improve medical care to the inhabitants of remote rural areas and to persons engaging in distant-pasture livestock raising, 67 mobile, 50 stomatological and 13 outpatient clinics have been created, and 166 units of diagnostic x-ray equipment are operating. The Ministry of Health placed social orders with all scientific research institutes and medical schools to carry out scientific clinical research in rural areas, and particularly in the Aral region. Medical institute departments have been instructed to provide methodological, organizational and consultative assistance to rural public health. Steps have also been taken to strengthen rayons suffering a lack of personnel. In 1990, out of 3,000 medical school graduates, around 80 percent of all specialists were assigned to primary public health units. The republic's institutions of higher education accepted 200 additional students from rayons suffering unfavorable ecological, social and economic conditions. Departments for the advanced training of middle-grade medical workers were opened in the medical schools at Ekibastuz and Kokchetav. The problem of establishing a nursing faculty in Alma-Ata Medical School has been solved in principle, and a stomatological faculty is now beginning to train specialists in Semipalatinsk's medical school. In Chimkent, a state pharmaceutical institute was established by a decree of the republic's Council of Ministers at the request of the Ministry of Health.

The problems of medicinal support to the population of Kazakhstan remained complex. There is a lack of medicinal preparations, and there is no hope for changing this situation in the foreseeable future. Neither pharmaceutical science nor practical public health has made its contribution to solving these problems. To make matters worse, none of the medical schools have yet added the subject of clinical pharmacology to their training programs, which is why the training of specialists in all profiles is suffering.

Development of procedures for local manufacture of medicines of plant and animal origin is producing the first encouraging results. The republic has the raw material base for this, but its possibilities are not being adequately utilized, although this is precisely one of the avenues that holds out a hope for eliminating the scarcity of drugs. All we have to be thankful for at the moment is that the Alma-Ata Pharmaceutical Factory has begun producing propolis solution, sea buckthorn oil, ginseng and calendula ointment. Our hope is that the list of the medicinal preparations in production will lengthen significantly in 1991. These hopes are reinforced by the increasing strength and growth of our local raw material base: Just

last year, around 110 tons of medicinal plants were procured in nine oblasts, as compared to the 97 tons planned. But our possibilities are far from exhausted: If we so desire, and if we are persistent enough, we can significantly improve the supply of locally produced medicines. Widening the network of herbal teahouses should become another important reserve. These teahouses (there are now only 23 of them), which make wide use of all kinds of extracts, infusions and cocktails, can become unique health centers. I feel that such herbal teahouses should be established not only at pharmacies but also in institutes, hospitals, medical stations and enterprises. This will open up a broad avenue for the initiative of cooperatives as well.

The supply of apparatus and equipment to medical and preventive institutions continues to be a complex problem in the republic. Despite the universal shortages, as a result of which orders placed for equipment are being satisfied by just a little more than half (51.8 percent), it is possible in 1990 to provide new facilities with much of what they need, if not 100 percent. What saved the day is that we managed to increase our allocations of medical equipment by an additional R750,000. Moreover, R3,339,800 worth of equipment was delivered on the basis of direct contracts, and furniture worth R426,000 was received. But this year we cannot hope for such a favorable beginning. The problem could be solved, besides by improving centralized deliveries, by placing orders with the republic's enterprises for the manufacture of medical equipment and furniture. This is a new and promising line of work. For example, last year equipment worth R4.6 million was manufactured on the basis of orders from therapeutic and preventive institutions, and equipment worth over R2 million was placed into operation. These indicators should be the starting point for this year. Now the market is dictating its own laws: Without initiative, resourcefulness and competent maneuver of resources, without reinforcing business ties with other ministries and departments, without introducing effective methods of stimulating production of medical equipment, we will be unable to solve the complex problem of providing children's and maternity hospitals with modern equipment, provide scientific research institutes and medical schools with the equipment and apparatus they need, or satisfy the needs of rural public health.

Improvement of the ecology of eastern and western Kazakhstan and the Aral region requires special attention and extreme measures. The cleanliness of the air, water, soil, pastures and agricultural products is evoking general alarm today, because our health depends directly upon it. This is why the problems of ecology and of reducing infectious morbidity must become objects of daily attention and surveillance on the part of public health executives of all ranks. Groups being formed by order of the ministry to monitor the use of pesticides and mineral fertilizers are also to play an important role. Thirty-three offices have been allocated to oblast health departments for this purpose, but the problem of staffing such groups has not yet been solved. On the other side of the coin, 1,500 more tests than usual were run in nine months of last year, but the quality of agricultural products remains the same in terms

of pesticide content. The reasons for this are that either the monitoring is ineffective, or agricultural industry is not reacting to the requirements of epidemiological stations.

Consistent implementation of measures to prevent radioactive effects upon the human body is becoming an important direction of the work of medical personnel. The volume of research on the radioactivity of construction materials has doubled. Efforts to monitor the concentration of radionuclides in medicinal plants, and the level of background gamma-radiation in foodstuffs and water have been organized in all places. A program for examining the population of rayons neighboring on the Semipalatinsk test range has been written. Funds totaling R3.5 million were allocated by a decree of the Kazakh SSR Council of Ministers to the Ministry of Metallurgy for the construction of new apartments in the settlement of Akchatau, Dzhezkazgan Oblast. A center for personal dosimetric monitoring of persons working in environments possibly subjected to ionization was organized under the republic's epidemiological department. A scientific research institute of radiation medicine and ecology is being opened by order of the Kazakh SSR Council of Ministers.

A number of measures have been implemented to improve the activities of scientific research institutes and institutions of higher education. The basic directions of scientific enquiry by all institutes were reexamined in 1990 with regard for developing fundamental research and raising the effectiveness of assistance provided to practical public health. The republic's 10 scientific institutions were raised to a higher category. Central scientific research laboratories were organized in the medical schools in Semipalatinsk and Tselinograd. Now all of the republic's institutions of higher education have central scientific research laboratories. A scientific research institute of urology was established. The ministry has formulated the social order to be placed with medical science. Scientific work in the Aral region and in eastern and western Kazakhstan and the problems of reducing maternal and child mortality and infectious pathology were identified as priority tasks.

Our ministry went to the USSR Ministry of Health to argue the need for opening eight specialized councils in the republic for defending candidate and doctor of dissertations in 16 scientific specialties. This is an important initiative in the effort to improve the training of scientific personnel. Under market conditions, high professionalism of workers is becoming the main component of the potential of any medical institution, and all the more so of institutions of higher education. Medical science must develop not only in the capital: Scientific personnel are also needed in every oblast center of Kazakhstan. It is also becoming the will of the times for a larger number of practicing physicians to generalize their work experience in the form of dissertations. No limits are imposed on anyone in this area.

Last year Alma-Ata sponsored the All-Union Congress of Geneticists, the All-Union Conference on Immunopathology, and international symposiums on family planning and AIDS prevention, all-union problem commissions held plenums here, and republic congresses of surgeons and

therapists were conducted. The Kazakh SSR Ministry of Health is actively establishing ties with China and Mongolia on problems of developing medical science and practice. The next stage in the program of primary medical care is being implemented successfully jointly with the Regional WHO Center. Programs being conducted in creative cooperation with medical scientists of Kazakhstan, the Central Asian republics, the RSFSR and Belorussia have also been spurred on.

There are plans for making a gradual transition in 1991 to insured medical care at public health institutions of Dzhezkazgan, Pavlodar and Taldy-Kurgan oblasts and in Alma-Ata. Efforts to improve the elements of the new economic mechanism in the work of therapeutic and preventive institutions will be continued: Specifically, brigade and leasing forms of labor will be widely introduced into practice, cost-accounting institutions and paid medical services will be developed, and so on. Special attention is to be devoted in therapeutic, preventive and organizational work to rayons suffering ecological disaster, and especially to rural rayons, and to improving the system of primary medical care further. There are also plans for creating an efficient system of medical care in emergency situations, and for AIDS prevention on a wide scale.

When it comes to the most important measures that need to be implemented right away, we should turn our attention primarily to improving the training of medical personnel. Unless we introduce a new system for developing the higher school, based on the paramount principle of stimulating both the student and the teacher, we will be unable to upgrade the quality of specialists. Still awaiting their solution are problems concerned with the qualifications of teachers, with abolishing wage leveling among scientists and instructors, and with certifying the republic's medical institutions of higher education and scientific research institutes. The current rating of our scientific and educational institutions is unsatisfactory. The training programs require radical reexamination. There is an urgent need for developing Kazakh-language instruction in institutions of higher education and medical schools. Much must also be done to raise the level of science in VUZes and scientific research institutes.

In the final analysis, reinforcing the material and equipment base of public health and medical science is one of the main prerequisites of improving public health. This is why the approach to evaluating scientific research work must be fundamentally altered. Selection of the most promising subjects of scientific research is becoming an especially important problem. The main criterion to be followed here is the importance of the subject, the level of the scientific research, the swiftness with which it is introduced into practical public health, and its economic effectiveness. With this purpose in mind, scientific collectives must develop and introduce scientifically substantiated evaluations of planned scientific research as quickly as possible, making wide use of computers, automated control systems and the best Soviet and foreign experience in this effort.

The approach to the problems of developing and improving health care for women and children is fundamentally different from previous years. As a first step, the state must show concern for improving the material and equipment base of maternity and children's therapeutic and preventive hospitals, and for equipping them with a modern level of ultrasonic, resuscitation, respiratory equipment and other apparatus and with sterile disposable kits of obstetric instruments.

Promising forms and methods of medical care to women and children based on integration of the obstetric, therapeutic and pediatric services are also waiting for their chance to perform. The practice of keeping the mother and infant together in maternity hospitals must become the norm, and not the exception to the rule as it is today. The organization of intensive therapy and resuscitation teams must finally move from the rank of something desirable to the rank of something real, which will doubtlessly make it possible to reduce child and maternal mortality. We also need to restructure the important area of preventing unplanned pregnancies. There is a mass of loose ends in this matter, the price of which is extremely high—the life and health of women.

Priority development of the outpatient-polyclinic service, which was proclaimed as much as three five-year plans ago, is not receiving appropriate reinforcement in the republic. And although some changes for the better have been noticed, material resources continue to be invested predominantly into construction and reinforcement of the hospital base. As a consequence the shortfall in the capacity of polyclinics remains high—hundreds of thousands of visits per shift. The situation is bad in this case not only in the countryside but also in large cities and in oblast centers. The material base of these institutions is extremely lacking, and diagnostic and resuscitation possibilities leave something to be desired.

The solution is to fundamentally change our approach to restructuring the outpatient-polyclinic service. What we need to do is introduce new quality standards, consistent treatment from one stage to the next, and criteria by which to evaluate the outpatient and polyclinic care provided in different specialties; we need to make a transition to progressive forms of economic stimulation of medical workers oriented on the end result, and we need to introduce material levers by which to control the quality and excellence of medical services.

The manner in which medical care is specialized must also be changed. Availability and quality should be the main reference points. At the moment, central rayon hospitals in many of Kazakhstan's rural rayons still lack traumatologists, orthopedists, phthisiatrists, ear, nose and throat doctors and ophthalmologists. Nor is the situation much better in city polyclinics. Specialists such as endocrinologists, oncologists, psychotherapists, neuropathologists and surgeons are in extremely short supply. Isn't this the reason why thousands of patients who are unable to obtain highly qualified care at their place of residence go to the clinics in Alma-Ata, and why many of them even travel to Moscow?



The republic and oblast diagnostic centers have not yet reached their full potential. The network of these centers will encompass practically all oblasts by 1995. Doctors and candidates of sciences from scientific research institutes and medical schools must be encouraged more extensively to work in polyclinics, especially in ones operating on a cost-accounting basis. The experience and knowledge of these scientists are inestimable, and given appropriate stimulation of their labor, they will provide enormous assistance to practical public health.

In the sector's transition to the new economic mechanism, we feel that introduction of new principles of organizing and managing public health and its economy will open up great prospects. We need to decisively reject routine, expensive and uninformative procedures, and boldly take the path of developing mass screening in polyclinics and diagnostic centers. There are plans for supplying diagnostic institutions with ASPON [expansion unknown] systems and other state-of-the-art computer technology and apparatus as soon as possible. Medical cybernetics is one of the main levers by which it will become possible to achieve a fast transition to the new principles of management in the conditions of a market economy.

The problems of tuberculosis remain urgent for Kazakhstan. According to data of the USSR Ministry of Health, each year this disease takes more than 21,000 human lives in our country. To our great regret, the largest contribution to this woeful statistic is made by our republic, in which mortality due to tuberculosis per 100,000 population is the Soviet Union's highest. Although the three principal indicators of this disease—morbidity, frequency of occurrence and mortality—have tended to decline in recent years, this should not give anyone cause to relax. This is only the appearance of well-being: While morbidity has decreased to some extent overall, the number of bacillar (that is, actively infecting) patients, each of whom carries the threat of infecting those around him, remains practically unchanged. The fact is that a bacillar patient infects from 10 to 20 persons per year on the average. This is precisely why tuberculosis is not a disease of the past, as was solemnly proclaimed from the loftiest podiums just recently: It is a present misfortune. Not only the social risk group of tuberculosis but also the risk group determined by state of health is widening. The latter includes the tens and hundreds of thousands of those who suffer from chronic nonspecific respiratory diseases—chronic pneumonia, bronchitis, tracheitis etc. Given the ecological crisis that has affected a number of regions of our republic, tuberculosis has been "brought down, but not vanquished."

The general line toward prevention that was proclaimed in Soviet public health remains a hollow declaration for the time being. This pertains wholly to our republic as well. The realities of life are that medical institutions have undergone extensive growth, that the material base is weak, and that the availability of medicines is poor. Prevention, which is called upon to reduce the number of patients, is not fulfilling its role: Today, 70 percent of the country's population is at risk of illness, 70 million persons

smoke, tens of millions are plunged into drunkenness and alcoholism, and the drug addiction problem is becoming acute.

This is why we need to diametrically alter the attitude of executives of public health institutions, of local soviets at all levels, and labor collectives toward developing a preventive health care system as a supplementary public health service, one which could and should be introduced into polyclinics, hospitals, medical stations, enterprises, schools, housing administrations and clubs, and stadiums, working on the basis of cost-accounting principles. Such health improvement centers do not take away from budget-supported public health: They only reinforce the latter's preventive orientation.

Medicine is beginning to make its appearance in the marketplace. Work under the new conditions, under which we can no longer count on support from only the state budget, places new issues on the agenda—acquiring economic experience, learning to earn money, and being able to create a market of medical services. Labor collectives will become the principal consumer in this market. They are called upon to show concern for their workers and for the families of the latter. But when we cast our vote in favor of the existence of the most diverse forms of providing medical care, we must also show all possible concern for the priority and sufficiency of guaranteed, free, state-supported treatment. Five of the republic's regions are currently undergoing an experiment in the introduction of the new economic mechanism into the public health system. The acquired experience will be gradually applied throughout the entire republic. Development of collective forms of labor and leasing relations should be adopted by local public health organizers and executives as their reference points. We await growth of the number of business contracts signed with industrial and other enterprises for rendering extra health care. We also hope to obtain valuable experience in organizing therapeutic and diagnostic activities using sources of financing other than the budget. The search for other, new organizational forms of work and of evaluating the labor of medical specialists, brigades, departments and entire institutions will also be continued.

Public health institutions will be converted to the conditions of the new economic mechanism tested out in the Kazakh SSR as soon as they are ready for such a step. And specialists of scientific research and medical institutes must take responsibility for providing scientific and methodological support to this highly important measure. © COPYRIGHT: "Zdravookhraneniye Kazakhstana" 1991

#### Medicine in the Transition to Market Relations

917C0519B Alma-Ata ZDRAVOOKHRANENIYE  
KAZAKHSTANA in Russian No 3, Mar 91 pp 17-20

[Article by Kazakh SSR Academy of Sciences Academician  
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UDC 61(574)

[Text] The transition to market relations in the country's national economy dictates the need for fundamentally

altering attitudes toward protecting the health of the population. The range of problems is extremely diverse in this area. What we essentially need is a complete overhaul of the approaches that have evolved over the decades. This includes changing attitudes toward personnel training, improving the organizational and structural mechanism, introducing new principles of financing practical public health and scientific institutions and the epidemiological service, improving ecological conditions and so on.

Reorganization of public health should naturally begin with the training of medical workers. As we know, one-third of all of the world's physicians are employed in our country. We are forced to assert, however, that the payoff that people receive from such an army is extremely inadequate. Consequently the first thing we need to turn our attention to is the quality of the training provided to future doctors. Perhaps we need to give some thought to reduce the number of students in the medical schools. In this way we could reduce the load upon the instructors, as a consequence of which the training the students receive will improve. Moreover a sizable number of scientific associates of the medical school departments will be able to engage more actively in research.

Another aspect of the problem is that under the conditions in which the availability of medicines is 30 percent of the demand of public health, and in which it is predicted that new difficulties will be encountered in providing various types of medical equipment, we also need to give some thought to organizing departments of popular medicine in institutions of higher education and in the Institute for Advanced Training of Physicians. And the AIDS epidemic that has begun in the world makes introducing the new discipline into the course on infectious diseases as a separate subject an urgent task. This is why the republic's Ministry of Health should introduce this innovation more boldly, without waiting for direction from the union ministry. The question that arises in this connection is how to distribute the functions of the union and republic ministries within the context of the union contract presently under discussion. This is a principled approach, inasmuch as local administrative organs could solve their own problems more efficiently, and it is not absolutely necessary for them to turn to the union Ministry of Health in regard to every local issue. The value of this approach becomes obvious when we consider the demographic and national features of the individual regions, the ecological and epidemiological situation, and the health of the population of each oblast taken separately. The union ministry, and sometimes even the republic ministry, is not always able to account for all of these factors. This is why the republic ministry must share some of its powers with the local administrative organs. The latter are the ones that should solve problems such as determining the optimum number of students and future specialists in particular professions, the number of beds in each specialty, and the demand for building or equipping new hospitals. From my point of view, the time has also come to place paramedic-obstetric stations, rural medical outpatient clinics, section hospitals, medical stations and some numbered rayon hospitals under the administration of local government organs.

As regards reorganizing the administrative structure of public health in the republic, thought should be given to reducing the administrative staff by abolishing the positions, and by combining oblast public health departments with oblast hospitals. Either the director of the oblast health department or the chief physician of the oblast hospital could become the director of such an association, while the main specialists would automatically be assigned to physicians as department directors. They would also be responsible for providing organizational, methodological, and consultative assistance on therapy within the oblast. The larger work load at the new positions should doubtlessly be compensated with money saved in wages. In turn, the Ministry of Health should reexamine reporting procedures right away, so that the mountains of correspondence could be reduced. Moreover such a review should be carried out with an eye on computerizing all of public health. Basing itself on this strategic task, the Ministry of Health should come to grips with the problem of providing personal computers to medical institutions and subsequently bringing them together into a sector network, and it should involve itself in the training of the appropriate personnel, and in providing computer software.

The next very important issue is that of introducing insured medicine. It must be said that we are not yet ready for this step. The main obstacle is the absence of legal mechanisms that could regulate the rights of patients and the responsibilities of medical personnel. Once the principle of a legal state is declared, the existing public health law should be reexamined completely. The new principles of management (cost-accounting polyclinics, paid services, insured medicine) should be reflected in it. At the same time, the people should also be aware of their rights in the medical institution—they should know the instances in which they may call certain actions into question. Moreover the court should know the code of laws on the basis of which they are entitled to examine appeals. Otherwise the population will feel itself to be deceived, and it will stop paying money out of its wages. The last circumstance is fundamental, since a good idea such as this could be cut off at the roots.

Day hospitals have recently enjoyed widespread acceptance. The goal of their introduction was a noble one—to reduce the stress on hospitals experiencing a shortage of room. However, analyzing some of the results, it can be said that there was a direct economic loss as well. The annual bed use indicator for the republic as a whole was 296 days—that is, 40,000 bed-days have been lost. Still, the money has already been allocated for this. On the other hand this fact suggests that patients prefer to undergo clinical examination in day hospitals rather than in conventional hospitals. We need to make the proper conclusions from these facts. First of all, we must reduce the number of beds in the hospitals, and improve conditions in the wards to the extent possible by reducing the number of patients in them. But it is important not to reduce the budget of the hospitals in this case. This, in my opinion, is one of the reserves for raising allocations per bed. Consequently money allocated for food—one of the most important factors of recovery—and for medicines, x-ray film,

supplies and equipment will increase. Second, we need to increase the load on diagnostic centers.

There are a number of factors behind the need for creating diagnostic centers in each of the republic's oblasts. One is concentration of scarce and sometimes unique diagnostic apparatus in a single institution. Moreover in the course of examinations the methods would become standardized, new methods would be introduced, the latest accomplishments of medical science would be utilized more actively, and expensive equipment would be used to a greater extent. At the same time these centers must not isolate themselves as an independent institution. It would be more suitable to coordinate their activities with large oblast and city institutions, where the main stage of patient treatment is carried out. It is precisely through cooperation between diagnostic centers and hospitals that the qualifications of their personnel will grow, since they will be able to compare clinical and preclinical diagnoses. Participation of diagnostic physicians in patho-anatomical conferences is especially important in this case.

The significance of medical science increases especially in the conditions of a market economy. It is only on the basis of the latest scientific and technical accomplishments that progress is possible in practical medicine. This is why one of today's priority tasks is to raise the prestige of the work of scientists. It is no secret to anyone that the interest of young people toward science decreased noticeably after the doubling of the wages of physicians in practical public health in recent years. This is understandable. After all, the wages of VUZ instructors and of scientific research institute associates have not undergone any kind of significant changes in the last 40 years. Can there be any discussion of a reasonable return from the main executors of scientific work—the junior scientific associates, the laboratory technicians and the assistants—if their average wages are only 100 rubles a month? In the meantime they do just as much work as doctors do, and in addition to that, they even carry out scientific research. With this approach, practical public health workers naturally lose all desire to take jobs in scientific research institutes or schools.

The times are such that the faulty practice that has evolved over the decades—that of providing allocations to scientific research on a residual basis—must be fundamentally changed. Assets should be transferred to scientific research institutes without someone regulating who should receive how much. When the research subjects are planned in this case, there should be a clear idea of what the end results of the work will be. And we shouldn't be afraid that someone will receive more, while someone else would receive less. That's not what's important. The main thing is the result. The intermediate results of scientific research should be evaluated after 2.5 or 3 years. If it is evident that the collective is unable to achieve its goal, the financing should be halted. There is an element of risk, but without it, you can't expect any forward progress. In the case of failure, the director of a research subject would be compelled to seek other work. Consequently both he who does the planning and he who does the work would be taking the risk, and in this case the former risks more—his name.

This is an effective factor. Owing to this approach, there will be no vacillating right from the early stages of the work. As we can see, the economic approach lies at the basis of all of this. When we plan scientific research, we need to determine the approximate proportion of fundamental, theoretical and applied developments. I feel, however, that such a division is arbitrary, since what we see predominantly in practice is application of so-called fundamental research. Effective use of lasers, of ultrasonic, x-ray and endoscopic research systems, monitoring apparatus and even the simplest medicines are all accomplishments of science. Considering this, we need to evaluate the scientific work as well. What we need is not control over the finest details, but a principled approach: Either the work will produce an economic advantage, or it isn't needed at all.

Introduction is the Achilles heel of science. But how can we demand concrete results from the introduction of scientific developments if the developer does not have the money even to order an experimental model of the apparatus, device or instrument he is creating? This is why it is important for the researcher to be free to spend his money as he chooses, and the Ministry of Health should display greater trust in those with whom state orders are placed. What we have at the moment is mountains of paperwork with what is often a zero practical impact. The time has obviously come to completely reexamine the activities of the RONMI [expansion unknown] with the intent of transforming its administrative organ into a cost-accounting section. This will make it possible to significantly reduce the totally unnecessary paperwork associated with drawing up patent reports and methodological and informative materials. Instead, this office will promote fast, high quality documentation of patent research to permit efficient introduction of those products of scientific institutions which enjoy a demand in practical public health institutions. We need to put an end to the faulty practice of publishing, free of charge, an enormous flow of information, most of which is filed directly in the trash can.

And one final thought—with the transition to market relations, the problem of training specialists in medical economics is becoming increasingly important. Institution directors lacking an economic education work blind, and this creates the danger of not only mistakes in planning, but something much more serious—violations of existing laws. Consequently the time has come to create management faculties or courses in medical schools. It may be a good idea to organize a department in the Institute for Advanced Training of Physicians jointly with the Kazakh SSR Ministry of Public Education. Apprenticeship of the best-trained physician-economists abroad could be foreseen in this case.

We obviously have to consider all of the problems facing public health organs under the conditions of the transition to market relations. However, the most important thing right now is to anticipate or predict certain trends, evaluate them, and find optimum solutions. © COPYRIGHT: "Zdravookhraneniye Kazakhstana", 1991

# **Characteristics of Infectious Morbidity in Arid Zones of the Kazakh SSR**

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[Article by Ye. S. Belozarov, K. R. Amrin, T. S. Dzhasybayeva and M. K. Mukanov, Alma-Ata Medical Institute, Republic Epidemiological Station]

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[Text] Despite the therapeutic and preventive measures presently being implemented, infectious morbidity, rather than decreasing, is exhibiting a tendency toward growth because of intensified migration of the population. Moreover the complex of environmental factors affecting the individual in different biogeochemical provinces has not yet been adequately studied or interpreted. It should be noted that the problem of environmental protection is inseparably associated with that of protecting the health of the population. Unfavorable effects of man's habitat pose a number of serious problems in this regard, particularly in the arid zone [1,3,4,5].

It may be supposed that changes in the quantitative and qualitative parameters of the arid zone influence both overall morbidity as a whole and the occurrence of infectious and parasitic diseases in particular. The increase in morbidity of the population of arid zones is probably the

consequence of a decrease in the overall resistance of the body as a whole and changes in immune status resulting from the combined action of chemical, biological and physical factors of the environment. Such effects are intensified by negative social and personal conditions in which the individual lives [2].

The objective of this paper is to study some forms of infectious and parasitic morbidity in the population of Kazakhstan's arid zones. The paper draws both from official statistics of therapeutic and preventive institutions, and from expeditionary materials gathered in arid zones by door-to-door surveys.

The research was based on collecting materials on overall morbidity in arid zones. The regions for which high morbidity associated with infectious and parasitic diseases is typical was established in this case. For example in 1988, this indicator was 5,682.1 per 100,000 population for children from 0 to 14 years old in Kzyl-Orda Oblast; the same indicator was 3,370.1 in Chimkent Oblast and 2,240.2 in Dzhambul Oblast. Infectious and parasitic morbidity among the adult population and juveniles was, respectively, 1,159.0, 750.9 and 822.8 per 100,000 population.

Detailed analysis of all of the materials showed that two-thirds of infectious diseases are represented by acute intestinal infections (AII's). In this connection the authors felt it important to trace the dynamics of AII morbidity in arid zones in 1973, 1978, 1983 and 1988 (see table).

**Morbidity Indicators for Intestinal Infections in Arid Zones of the Kazakh SSR (per 700,000 Population, Adults and Juveniles)**

Disease Class	Oblast/Year							
	Kazakh SSR				Dzhambul			
	1973	1978	1983	1988	1973	1978	1983	1988
Typhoid fever	10.6	9.4	10.5	4.6	15.0	18.3	10.2	8.2
Paratyphoid A, B, C	1.0	2.8	2.0	0.5	2.1	2.6	1.2	1.9
Other salmonellosis infections	15.6	68.1	53.4	44.4	5.0	41.3	135.2-	66.8
Bacterial dysentery	787.5	298.4	242.2	156.3	599.1	315.5-	217.6	114.1
Including bacteriologically confirmed	367.3	120.9	125.9	99.1	218.3	87.1	94.5-	74.8
Dysentery								
Flexner's	191.2	70.6	67.2	62.8	166.2	58.1-	64.5	66.4
Zonne's	164.0	57.0	25.4	34.3	44.9	28.2-	11.5	30.9
Enteritis, colitis, gastroenteritis evoked by an established disease agent	-	34.8	73.3	110.3	-	20.1	33.7	151.6
Other intestinal infections	488.4	351.1	384.8	355.3	528.1	358.8-	424.3	390.5
AII's and dietary toxic infections evoked by unestablished disease agent	1275.9	316.3	311.5	245.0	1127.2	363.8	390.5-	238.9
Total AII	1275.9	649.5	627.0	511.7	1127.2	674.3	641.8-	504.7
Viral hepatitis	318.5	499.4	550.1	402.0	381.3	471.8-	725.9	385.1
Including serum hepatitis	-	14.2	21.3	25.6	-	5.3	35.5	48.4
Total, absolute numbers	400474	180407	199101	150729	22764	20281-	26154	19217



**Morbidity Indicators for Intestinal Infections in Arid Zones of the Kazakh SSR (per 700,000 Population, Adults and Juveniles) (Continued)**

Disease Class	Oblast/Year							
	Kzyl-Orda				Chimkent			
	1973	1978	1983	1988	1973	1978	1983	1988
Typhoid fever	41.9	55.0	93.4	24.2	14.2	15.9	21.4	10.0
Paratyphoid A, B, C	5.3	42.7	25.2	3.4	1.0	1.5	0.8	0.8
Other salmonellosis infections	11.7	52.5	63.0	75.7	3.1	25.5	39.3-	24.9
Bacterial dysentery	428.4	305.4	186.4	88.9	647.4	302.2-	201.4	101.7
Including bacteriologically confirmed	140.6	42.5	57.4	48.7	323.5	111.0	95.6-	64.3
Dysentery								
Flexner's	107.8	35.8	41.6	77.4	235.4	61.4-	60.9	73.2
Zonne's	31.1	15.8	5.5	16.8	61.7	23.7	9.6-	21.2
Enteritis, colitis, gastroenteritis evoked by an established disease agent	-	10.5	30.22	81.1	-	67.2	135.0	156.2
Other intestinal infections	687.5	471.3	558.3	666.0	634.8	603.3-	547.4	579.8
All's and dietary toxic infections evoked by unestablished disease agent	1116.0	309.5	528.1	583.9	1282.2	536.0-	412.4	423.6
Total AII	1116.0	776.7	744.6	754.9	1282.2	905.6	748.8-	681.5
Viral hepatitis	347.9	2006.0	685.5	484.4	409.1	839.4-	982.1	773.2
Including serum hepatitis	347	7.3	13.1	30.4	-	22.5	17.8	42.1
Total, absolute numbers	13859	22908	17704	155547	41709	52727-	53617	50205

It follows from the table that on the whole, all of the indicators exceed the union and republic levels. For example, typhoid morbidity exceeds the union indicator in Dzhambul and Chimkent oblasts by a factor of 1.5-2, and in Kzyl-Orda Oblast by a factor of 8 (3.17 in the USSR). Morbidity exceeds the union level by a factor of 2 for paratyphoid (1.28 in the USSR), by a factor of 4 for salmonellosis (17.2 in the USSR), and by a factor of 1.5 for total AII (601.9 in the USSR).

As far as viral hepatitis is concerned, a relative decline in morbidity was noted both in the republic as a whole and in the arid zones; nonetheless it was 1.5 times higher than the union indicator (304.57 per 100,000 population in the USSR).

A decline in morbidity in 1988 was also noted among patients with dysentery (including bacteriologically confirmed), enteritis, colitis and gastroenteritis evoked by an established disease agent, which is associated with partial implementation of measures to improve the environment in arid zones, and particularly to reduce the negative effects of the water factor. On the whole, the high indicators for intestinal infection morbidity provide the grounds for suggesting the need for conducting a large-scale search and introducing new, fundamental developments, specific to arid zones, of methods for preventing infectious diseases.

In addition to analyzing AII morbidity, we studied the occurrence of helminthiasis in the population of arid zones, in its dynamics in 1973, 1978, 1983 and 1988. On

the whole, the data showed that these regions are typified primarily by occurrence of hymenolepiasis and enterobiasis. Ascariasis is additionally revealed in locales with a farming profile (Dzhambul and Chimkent oblasts).

For example, the indicator for hymenolepiasis morbidity in Kzyl-Orda oblast in 1973, 1978, 1983 and 1988 was 217.4, 236.2, 208.5 and 159.8 per 100,000 population in the corresponding years, in Chimkent Oblast it was 175.7, 159.3, 141.4 and 140.4, and in Dzhambul Oblast the occurrence of hymenolepiasis was 179.0, 168.3, 130.6 and 84.5 per 100,000 population.

It should be noted that the indicator for hymenolepiasis morbidity in arid zones exceeds the republic indicator by a factor of 2.5-3 (72.9, 60.4, 45.8 and 35.3 respectively).

As far as enterobiasis morbidity per 100,000 population is concerned, in Kzyl-Orda Oblast it was 615.7, 404.6, 529.4 and 982.5 respectively in the years investigated, in Chimkent Oblast it was 193.5, 134.1, 147.4 and 297.1, and in Dzhambul Oblast it was 540.3, 427.9, 614.2 and 695.0. The enterobiasis morbidity indicator for the republic was, respectively, 483.6, 707.0, 740.5 and 861.5.

Diphyllobothriasis and opisthorchiasis morbidity is not typical of arid territories. These diseases are not even recorded in official statistics.

In oblasts of the arid zone of interest to us, echinococcosis and alveococcosis were revealed in Dzhambul and Chimkent oblasts during the period under investigation. In

this case the morbidity indicator varied from 0.7 to 3.7 per 100,000 population as compared to republic figures of 0.75, 0.83, 0.85 and 1.4 in the corresponding years.

Investigation of the occurrence of trichocephalosis and taeniarhincosis in the population of arid territories revealed that these forms of helminthiasis are typical of Chimkent Oblast. Thus, the indicator for trichocephalosis here was 28.3, 6.8, 4.5 and 3.0, while for taeniarhincosis it was 16.1, 11.2, 7.5 and 9.3 per 100,000 population. The indicator for the republic for these forms of helminthiasis was 13.7, 6.0, 3.1 and 2.2, and 10.1, 6.8, 4.7 and 3.4 respectively for the years indicated above and the form of helminthiasis.

Ascariasis morbidity in Dzhambul Oblast was 124.0, 63.7, 74.2 and 42.3, and in Chimkent Oblast it was 89.5, 52.4, 54.9 and 50.7 per 100,000 population. The republic indicators are 86.8, 51.8, 58.3 and 41.9 respectively.

It may be hypothesized that the nature and growth of morbidity are influenced by the regional distribution, ethnic features and traditions of the local population. Morbidity doubtlessly depends, in this region, on the degree of contamination of waters of the Syr-Darya and Chu rivers as well. For example, AII morbidity in the Syr-Darya river basin, in its upper reaches (Chimkent Oblast), is twice lower than in Kzyl-Orda Oblast (its middle reaches).

In order to complete the description of infectious morbidity of the population of arid zones, we analyzed the basic causes of deaths resulting from human pathology on the basis of existing classifications. We established that mortality due to infectious and parasitic diseases is higher in arid zones than in the republic as a whole. Thus, this indicator in Kzyl-Orda Oblast was 53.8 per 100,000 population, which is 2.2 times higher than the republic indicator (23.8), while in Chimkent oblast it was 38.2, which is 1.5 times greater than the indicator for the republic. In Dzhambul Oblast, mortality is similar to republic mortality.

Thus the importance and urgency of the problem of reducing infectious morbidity in arid zones requires an interdisciplinary approach to it. Further development of differentiated systems of therapeutic and preventive measures tailored to arid territories is required. The patterns of development of the health of inhabitants of arid zones await more-detailed study.

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#### Problems of the Transfer of an Ophthalmological Scientific Research Institute to New Economic Management Conditions

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[Article by A. G. Travkin, O. A. Zolotova, O. A. Kiseleva, M. G. Ter-Grigoryan, T. S. Mergeladze, and L. M. Mazurova, under the rubric "ORIGINAL ARTICLES"]

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[Text] Starting on January 1, 1989, medical science, in accordance with the resolution of the CC CPSU [TsK KPSU] [Central Committee of the Communist Party of the USSR] "On the Transfer of Scientific Organizations to Complete Cost Accounting and Self-Financing," shifted to the new economic management conditions. The introduction of the cost accounting mechanism into the activity of the medical establishment will permit the resolution of extremely pressing problems of our public health system, i. e., the assurance of the effectiveness and quality of treatment and prevention operations, the strengthening of collectives' responsibility for, and interest in, end results, and the concentration of resources in the development of the strategic orientations of medical science.

The planning of the apportionment of budgetary appropriations from the budget for the maintenance of the medical scientific institutions of the USSR Ministry of Health [Minzdrav SSSR] has been abolished since 1989. A system of agreed relationships between the USSR Ministry of Health and the scientific institutions has been introduced, oriented to the performance of fundamental research and of applied scientific research work (SRW) [NIR], and to the development of new medical technology, instruments, facilities, and equipment for medical purposes, of methods for the diagnosis, prophylaxis, and treatment of diseases, of medicinal



preparations, and of new forms of organization, management, and training, as well as to their upgrading. Agreements will be concluded only for investigations which will promote the substantial amelioration of the specialty problem. The carrying out of an expert assessment of SRW planned in the fields of oncology, phthisiopulmonology, ophthalmology, and hematology has been proposed, as an experiment. An announcement has been published in "Meditsinskaya Gazeta" [Medical News] regarding an SRW competition for all studies, including programmatic investigations, of any level, with due consideration of their comprehensive accomplishment.

The "Microsurgery of the Eye" interindustry research and engineering complex [MNTK] has priority in the public health system in the use of cost accounting methods. Using consolidated norms of per patient expenditures for service and treatment, the "All-Union Scientific Center [VNTs] of Restorative Traumatology and Orthopedics" and the medical associations of Kuybyshevskaya and Kemerovskaya oblasts are also operating effectively on the principles of cost accounting.

Preparation for the transition to the new management methods is also taking place in the Moscow Helmholtz Research Institute of Eye Diseases (MRIED) [MNIIGB].

The problem of the development of long-term economic norms is one of the most complex in the preparation of medical science for the transition to cost accounting. A system of economic norms of expenditures for the examination and treatment of patients under the conditions of a specialized ophthalmological institution has been developed in the Helmholtz MRIED. The complexity of the development of norms at the Helmholtz MRIED consists in the fact that the spectrum of scientific and clinical activity of the institute is extremely broad: the treatment of glaucoma, of viral diseases of the eye, of injuries to the visual organ, of pathology of the retinal membranes, and of ocular diseases in children; ophthalmology, the physiology and hygiene of vision, etc. As the result of many years of research at the Helmholtz MRIED, fundamentally new methods of the diagnosis and treatment of ocular diseases have been developed, the introduction of which into broad practice has permitted the substantial improvement of the quality of ophthalmological care of the population. Six all-union centers are functioning based at the institute. Specialization in combined methods of examination and treatment, in which the utilization of flow method technology is impossible, is a specific feature of the Helmholtz MRIED. At the same time it must be noted that 61 percent of the institute's patients have been previously operated on unsuccessfully in the outlying localities. A great deal of attention is being devoted to the development of internal medicine treatment methods. Among the patients of the institute's ambulatory department, 68 percent of patients are of the internal medicine profile.

A new, versatile nonoperative method for the prevention and treatment of progressive myopia, a scleral reinforcing

injection (SRI [ISU]), has been developed in the department of the protection of the vision of children and adolescents. More than 2,000 SRI have been carried out in the ambulatory day hospital.

New methods of conservative, laser, and surgical treatment of vascular diseases of the eye have been successfully developed in the department of retinal pathology. The employment of comprehensive treatment of hypertensive venous thromboses of the retina in the hospital and outpatient service has made it possible to rehabilitate 80 percent of the patients, and significantly (25- to 30-fold) increase the number of patients treated. Care has been extended in the department to 2,000 foreign citizens with retinal abiotrophy, using the Encad preparation developed in the institute.

More than 200 varieties of operative interventions have been carried out in the department of traumatology, restorative surgery, and ocular prostheses in cases of injuries to the visual organ; among these, 86.7 percent have been in the category of operations of higher complexity.

More than 1,000 operations per year have been carried out in the department of ophthalmology; of these, 75 percent have been carried out with the aim of the local destruction or removal of the tumor, and the preservation or restoration of the affected organ. Occupational rehabilitation has been achieved in more than 50 percent of patients.

The relative significance of individual treatment methods is great at the Helmholtz MRIED; the most progressive advances in ophthalmology have been introduced; for this reason the method of clinical-statistical groups (CSG [KSG]), which is in effect abroad for the calculation of the cost of diagnosis and treatment, has not proven to be suitable for the institute<sup>1</sup>.

A system of economic norms has been worked out at the Helmholtz MRIED for an ophthalmological research institute, one which takes the specific characteristics of the given medical institution into account. A clinical information bank was created for the calculation of the economic norms, an analysis was made of disease histories for recent years, and classifiers were developed of types of diagnostic investigations and procedures, and of equipment used in the treatment and diagnostic process, instruments, etc. Lists of procedures, in which all the types of expenditures, types of procedures, etc., were enumerated in accordance with the treatment technology for various diseases, were drafted for each costed item. The following are costed items at the Helmholtz MRIED: the cost of the clinical diagnostic examination (based on nosological entities); the cost of operative intervention (based on types of operations, whether out-patient or in-patient); and the cost of the patient's stay in the hospital.

Expenditures for the complete course of the patient's treatment in the hospital include (given the appropriate indications) the cost of outpatient examination before hospitalization and the cost of after-care in a consultative polyclinic following discharge.

Two scales of economic norms have been developed in the Helmholtz MRIED in keeping with the specific characteristics of the functioning of the medical institution. The first, which includes expenditures for the amortization of capital assets, provides an idea of the magnitude of the full (national economic) expenditures for each specific disease category. Such a system of norms is necessary for the calculation of the efficiency of an institute's activity. The second scale, which includes only current expenditures, is the basis for the settling of accounts with the higher-echelon organization for reimbursement for treatment expenditures.

The magnitude of the expenditures for specific types of treatment is established on the basis of the elements of the estimate of outlays for clinical activity, as well as of the sub-heads of the estimate of outlays for scientific activity which relate to the treatment process (for example, the pay of scientific workers directly participating in the treatment

process). In addition, the cost of amortization of capital assets, including equipment, is taken into account in calculating the norms.

All the sub-heads of the estimate are divided into two groups: included in the first group are those expenditures which can in fact be taken into account in the costing (expenditures for labor, outlays for medications, outlays for food, amortization, etc.); expenditures which cannot be related to a specific costed item (operational and administrative outlays) are included in the second. The expenditures which belong to the second group relate to the cost of a specific service in proportion to their relative share in the estimate of outlays.

Labor expenditures are determined either by expert evaluations, or through a time-study of each operation or clinical-diagnostic examination, or in accordance with the average length of hospital stay.

An example of calculation of the cost of one operation carried out at the Helmholtz MRIED is given in the table.

Calculation of the Cost of a Standardized Keratotomy Operation (in Rubles)

Type of work	Operation	
	outpatient	in-patient
Diagnosis	2.58	2.58
Preoperative preparation	1.00	1.00
Surgical treatment	2.62	2.62
Postoperative treatment	1.00	70.00
Total...	7.20	76.20

The norms of expenditures for treatment based on the nosological entities establish the total amount of the outlays for each group of diagnoses. The system of norms which was developed permits the making of a judgment as to which part of the costs for each nosological entity is laid to the outpatient, the in-patient, and the restorative forms of ophthalmological care. The program of the institute's activity is determined on this basis.

The functioning of the economic management mechanism in a medical institution presupposes the formation of a scientific and social development fund, and an incentive fund. The difference between the price and the cost of a service is the source of these funds. The pricings for these services are formulated on the basis of the scale of current expenditures and the profitability index.

The scientific and social development fund includes outlays for the replacement of the capital assets (according to norms established in percents of the deductions for depreciation), and outlays for technical re-equipment, the modernization of equipment, the carrying out of health-improvement measures, the acquisition of travel or vacation vouchers, and price reductions for food in dining rooms and cafeterias for the institute's employees. The resources for the incentive fund are expended in accordance with a regulation formulated by the Helmholtz MRIED.

Income remaining at the disposal of the Helmholtz MRIED should provide it the funds to cover the outlays for wages, and for production and social development.

In order that economic commitment be maintained, the system of norms should remain stable over a number of years. It should then be reviewed, since an increase in the quality of treatment and the introduction of new advanced methods almost always implies an increase in outlays. Therefore the timely reflection in the expenditures of the cost of new medical technologies, types of equipment, and types of procedures is necessary in order to stimulate scientific efforts. The problem of the introduction of scientific developments in our medical system is extremely pressing at the present time, since economic stimuli for its resolution are lacking. The creation and introduction of a system of norms, and of an economic management mechanism based on them presupposes that the financial resources of the institute will be formed from various sources. At the same time, the treatment of "thematically classified patients" (the proportion of whom is now 92 percent) will be carried out using the resources of the state budget. The expenditures of the Helmholtz MRIED for contractual services will be covered from the resources of enterprises and organizations paid out of social development funds for the medical servicing of their employees. Work directed toward the conclusion of contracts and the establishment of agreed prices is already going on at the institute. And, finally, the third source is represented by

the monetary resources of the population for payment for medical services provided over and above the socially guaranteed norm in the organized fee-for-service polyclinic of the Helmholtz MRIED.

The transfer to new economic management conditions of an institution as unique in its specific characteristics as the Helmholtz MRIED is tied to a number of objective difficulties, the chief difficulty being the insufficiency of financial and material resources needed for repair and reconstruction of facilities and for the purchase of new types of equipment. The institute is experiencing acute need related to the construction of a new treatment block.

The initial conditions of the functioning of treatment institutions must be taken into account in the planning and distribution of resources from the state budget; otherwise single-specialty medical institutions will end up in the well-known position of inequality under the conditions of cost accounting and self-financing. The solution of many problems must be faced for the successful development of cost accounting methods; the forming, for example, of a system of regulations regarding internal cost accounting, and the formulation of criteria on the basis of which the contribution of each worker and of each subdivision to the final result will be assessed. At the same time it is necessary to differentiate these criteria for scientific workers, medical scientific workers who participate in the treatment process, and workers in the administrative-economic management subdivisions. In addition, it is necessary to work out objective criteria for the assessment of the scientific production of the institute.

Even now, before the transition to cost accounting, it is clear that Helmholtz MRIED will run up against many difficulties, because it will be working under conditions in which all of the remaining medical system will be functioning as in the past. How will the consultations of specialists and the training of its employees be paid for by the oblast public health department in which these outlays are not provided for in the budget estimate? Will the rights of managers to use the resources of social development funds throughout the years of the five-year plan be expanded? The solution of these and other questions face the Helmholtz MRIED and other medical institutions which are shifting to cost accounting in 1989.

#### Footnotes

<sup>1</sup> In our country, norms of the CSG type have been developed in the N. A. Semashko Oblast Clinical Hospital of Nizhny Novgorod by a group of authors under the guidance of V. M. Rutgayzer. The CSG method presupposes the determination of a typical, general schema of the treatment of patients with identical diagnosis.

#### Problems in Pharmaceuticals Supply of the Country's Population

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[Text] The pharmaceuticals supply of the country's population is one of the most important social objectives. Pharmaceutical workers, in accomplishing it under conditions of ever-increasing shortages of pharmaceuticals, are making maximum efforts to satisfy patients' needs, at least for the principal and vitally important preparations. However, due to a large number of conditions and factors, this becomes more difficult with every passing day.

One of the principal factors is the absence of a domestic pharmaceutical industry, which in recent years has not only not been strengthened, but has been functioning on its "last legs". New capacities for the production of pharmaceuticals have practically not been introduced in recent five-year plans, while operating production systems have undergone only technological re-equipment and cosmetic repairs. Three years ago the government passed a resolution regarding the construction of 37 plants for the production of pharmaceuticals, but not one of these has been built. Therefore the satisfaction of the public health system's needs for pharmaceuticals by domestic production has dropped annually: 52.1 percent in 1985; 46.7 percent in 1989; 39.1 percent is expected in 1990; the forecasts for 1991 are still worse. In the presence of a demand for 7.5 billion rubles, the allocation of resources by the domestic production system is 2.7 billion rubles, i. e., 36 percent of the need, and this is under the condition of the allocation by the USSR Ministry of the Medical Industry [Minmedprom] of currency in the amount of 166 million rubles, while in its absence the satisfaction of need is expected at the 19.5 percent level, which is below the critical condition. The non-fulfillment of the Resolution of the USSR Council of Ministers of February 18, 1988 "On Measures for Increasing the Production of Pharmaceutical Preparations and the Full Supplying of Treatment-Prophylactic Institutions, the Population, and the National Economy With Them in 1988-1995" has practically led to a breakdown of the program for the creation of a modern domestic chemical-pharmaceutical industry. Blood preservatives and infusion solutions are being delivered to the public health system at a rate 21 percent below the target set by this resolution.

The Resolution of the USSR Council of Ministers of June 20, 1988 "On Measures for the Further Improvement of the Protection of the Health of the Population and the Strengthening of the Materials and Technical Base of the Public Health System" has been poorly fulfilled. Of 72 listed items, the USSR Ministry of the Medical Industry failed to meet the target for six preparations, including the target for euphylline (for injection), calcium chloride (for injection), remantadine (tablets), sulfacyl (eye drops), naphthyzine, etc. Extremely necessary pharmaceuticals have been undersupplied by the agro-industrial combine: ATP, lidase, ronidase, mustard plasters, etc. The situation has not improved in the current year, which has led to the denial of analgin (for injection), calcium gluconate (for injection), levomycetin succinate, etc., to patients.

Today, the domestic industry is not completely satisfying the public health system's requirement for any pharmacotherapeutic group of pharmaceutical agents. More than

200 listed items of the pharmaceuticals ordered by the public health system have not been supplied by the industry. In 1990, 73 preparations have been supplied at below the 1989 level, including widely demanded items: citramon [tsitramon], nitroglycerine, naphthyzine, activated charcoal, etc. One out of three patients cannot obtain analgesics from the pharmacy, and one out of two cannot obtain cathartics.

The satisfaction of requirements for domestic preparations of the principal pharmacotherapeutic groups of pharmaceutical agents, which are vitally important for the treatment of patients and the carrying out of preventive measures remains extremely low: cardiovascular agents, 28.1 percent; antidiabetic agents, 9.9 percent; psychotropic agents, 28.2 percent; blood substitutes, 21.6 percent; hormones and enzymes, 22.5 percent; diagnostic agents, 33 percent; antibiotics, 65.8 percent. The satisfaction of requirements for analgesics and anti-inflammatory preparations is at 40.6 percent. The situation with respect to pharmaceuticals supply is complicated by the continuing failures in planned deliveries of medicinals by industrial enterprises. The production of medicinals was undersupplied by the domestic industry (according to current data) for nine months of 1990 by the sum of 81.8 million rubles, including acetylsalicylic acid, 15,900 packets; ascophen [askofen], 29,100 packets; citramon 135,300 packets; pyrcophen, 44,000 packets; pentalgina, 28,700 packets; 860 million mustard plasters; ethazole (granules), 712,000 packets; cough tablets, 43,200 packets; amidopyrine, 6,950 kg; pancreatin, 6,897 kg; 40 percent glucose solution, 3,000,000 10 ml ampules.

A large number of plants of the domestic chemical and pharmaceutical industry have recently been closed on the basis of ecological conditions, which, according to the calculations of the USSR Ministry of the Medical Industry, has led to the loss of medicinal production in the amount of about 1 billion rubles. At the same time, the situation of one production system disorganizes the long technological chain for the production of other preparations. Thus, the lack of the raw materials for the production of analgin led to a 70 percent reduction in its output, and it is a constituent in the preparation of a large number of complex pain-relieving agents, which patients also do not receive.

In order to somehow decrease the shortages in pharmaceuticals, the government annually allocates currency for the purchase of pharmaceuticals abroad. Today there is practically no country that can manage without the import of pharmaceuticals; however, at the same time the indigenous industry develops and grows stronger concurrently, and the sale of its own pharmaceuticals to foreign countries takes place in equal amounts.

Our relationships with our partners have been built, on the other hand, on the export of fuel, metal, and electrical energy, while we receive pharmaceutical preparations in exchange; thus we have financed the development of the pharmaceutical industry in other countries, without taking care of our own.

However, due to the economic crisis which has been growing in our country, the allocation of currency reserves for the purchase of medicinals abroad has constantly become more difficult. Moreover, the USSR Vneshekonombank has not been paying off accounts due for pharmaceuticals already received; for this reason large stores of medicinals for designated orders have been piling up at foreign firms. As of October 1, 1990, only one-fourth of the pharmaceuticals purchased in the capitalist countries have been reimbursed. Therefore some leading firms have decided to cancel contracts for their delivery in 1990, and the conclusion of contracts for 1991 for the delivery of vitally important pharmaceuticals has become complicated.

The state of affairs is no better in the pharmacotherapeutic factories of our system, whose production constitutes 5 percent of domestic pharmaceuticals in total volume of the resources, which are producing about 160 of the listed preparations in wide demand (tinctures, drops, ointments, etc.) that the enterprises of the USSR Ministry of the Medical Industry are not producing. The rate of growth of the production of the factories' products in 1989 was 10.9 percent. However, it could be much higher if the pharmacotherapeutic factories could work at full capacity. They are operating at only 60 percent of capacity at the present time. The basic causes: poor supply of raw materials (50 percent of requisitions are filled); outmoded technological equipment; lack of glassware (50 percent of requisitions are filled, including satisfaction of only 13 percent of the requirements for glass tubes, for the packaging of iodine, potassium permanganate, etc., which should be available in every pharmacy). An especially severe situation has developed due to the lack of glass tubes in the production of bacterial and viral preparations, including preparations for the treatment of dysbacteriosis.

The situation will be even more difficult in 1991, in connection with the fact that up to the present time funds have not been allocated to the public health system by the USSR Ministry of the Medical Industry and other industrial ministries and agencies for the production of medicinals, and that supplier enterprises have declined to conclude contracts for the delivery of pharmaceuticals. The decisions taken by the RSFSR and UkSSR Councils of Ministers regarding the licensing of distribution of all the products produced on the territory of these republics have entirely disrupted the developed production links. All this is reflected in the receipt of pharmaceuticals in the first quarter, and unless extreme measures are taken, will be reflected in 1991 as a whole, which will evoke acute sociopolitical reverberations in society. For this reason, a centralized system of medicinal supplies must be maintained under the conditions of the shift to market relationships in the country. Due to the presence in the USSR Ministry of the Medical Industry of monopolist plants for the preparation of specific preparations, today not one republic can independently solve the problem of the pharmaceuticals supply of the population. How, for example, can the public health system of Russia get along without morphine, omnopon, promedol, and phentanyl, which are produced only by the Kharkov "Zdorove" Production



Association [PO]. The Ukraine, in its turn, obtains codterpin [kodterpin], codtermopsis [kodtermopsis], pyrcophen, and piperazine from the Tomsk chemicopharmaco-therapeutic plant. In Kazan, the "Tatkhimfirm" plant produces novocainamid, calcex [kaltseks], urotropin, irinite [irinit], etc. for the entire country. The Lvov "Lvov-farm" Production Association is monopolistic with respect to the production of strophanthin, corglycon, vicalin [vikalin], and many such instances can be cited. More than 80 percent of the listed items of the entire production produced by the industry are among those which are monopolistic for the union republics.

The growing complex of unresolved problems in the domestic industry leads to social tension in relation to questions of pharmaceuticals supply in connection with the shortage or absence of the simplest pharmaceuticals: analgin, pyrcophen, corvalol [korvalol], preparations of valerian and motherwort, Zelenin drops, cathartics, chologogic agents, mustard plasters, etc. Articles have appeared in the newspapers "Rabochaya tribuna," "Meditinskaya gazeta," "Moskovskiy komsomolets," "Izvestiya," etc., regarding the lack of these and other pharmaceuticals. Deficiencies in the operation of pharmaceutical institutions are the main feature observed in these articles. In fact, there are such deficiencies which include inadequate professionalism, leading to errors in the determination of need, and cases of a lackadaisical attitude of particular workers to their duties, a low level of information efforts, extremely low efficiency in the management of medicinal supplies, etc. However, these inadequacies account for not more than 10 percent of the overall causes of the "pharmaceuticals hunger".

However, society is not confronted in the published articles with the problem of the necessity of the most expeditious creation of a pharmaceuticals industry. The managers of the pharmaceuticals industry make declarations that are not thought-through which oversimplify quite complex problems of the medical industry, and which put forward incompetent advice regarding the accomplishment of the work of the pharmaceuticals service. Thus, it is suggested that all the problems of pharmaceutical supply be solved by automating the processes of studying demand and of the determination of the need for medicinals. Today, of course, no one objects to the introduction of modern computers; however this will not increase the amounts of pharmaceuticals produced by the domestic industry, and will not raise the annually decreasing percentage of satisfaction of the public health system's requirements for pharmaceuticals.

Nevertheless, however convincing the objective factors for the lack of pharmaceuticals may be, the crisis which has developed in relation to the pharmaceuticals supply in this country could be significantly reduced by a more conscientious, honest and principled work attitude on the part of pharmaceutical workers. How, for instance, can one explain the fact that at the time of stock-taking at the Lvov Central Pharmaceutical Warehouse, 900 listed pharmaceuticals, orders for which have been entirely satisfied, did not show up?

As a result, the number of people who have expressed well-founded agitation with regard to the lack in outlying localities of the simplest pharmaceuticals, and with regard to the necessity of acquiring them at additional expense, has been growing. One out of five citizens questioned in the course of an investigation carried out by the USSR State Committee on Statistics, declared this, in particular, to be the case. Many had obtained necessary pharmaceuticals only by turning to the higher organs of the management of the public health system, having lost all hope of positive consideration of their requests in the outlying localities.

Cases of illegal refusal to sell to citizens are not isolated, nor are cases of keeping them from purchasers and other abuses on the part of workers in pharmaceutical institutions of the RSFSR, the Ukraine and the Tadzhik Republic. Directors of local "Farmatsiya" production associations are manifesting a lack of principle in their examination of such signals, which gives rise to a sense of impunity and leads to criminality. At the same time, the timely curtailment of such instances would be of benefit to patients, and would increase the authority of the pharmaceutical service. The sudden checks organized in May-June 1990 by the USSR Ministry of Internal Affairs [MVD] revealed facts regarding the keeping of pharmaceuticals in pharmaceutical institutions of Stavropolskiy Kray, the Tatar ASSR, and the Rostov, Lugan, Dnepropetrovsk, Lvov, and Transcarpathian Oblasts. In the Lvov Oblast alone, more than 6,500 rubles worth of various pharmaceuticals were held back from general sale.

Due to a weakening of exigency in relation to compliance with the law in the pharmaceutical network of the RSFSR, the Ukraine, and the Belorussian, Georgian, Turkmen, Armenian, and Azerbaijanian Republics, favorable conditions have arisen for the theft of pharmaceuticals. Shortfalls here have been reckoned at 10,000 to 70,000 rubles and more. Overall, losses are not decreasing from shortfalls and thefts of pharmaceuticals of the pharmaceutical network throughout the country.

For example, in the Ukrainian Republic, an increase in shortfalls and thefts has been recorded in every second oblast "Farmatsiya" association. Meanwhile, an in-depth official investigation with the aim of identifying the causes of the creation of shortfalls has usually not been carried out; the question of a loss of confidence in individuals who have permitted large shortfalls to occur has not been raised to the point of intervention on the part of the procurator's office. Cases of the theft of medicinals with subsequent sale to cooperatives where they are resold at excessive prices are not rare. When a number of stomatological polyclinics in Leningrad alone have been checked, the theft of 350 ml of sombrevin and of 70 ampules of phentanyl was discovered. The stolen preparations were used in the co-ops to render aid to patients for a supplementary fee of up to 50 rubles.

In connection with the above, it has seemed advisable to the public health system organs in the outlying localities, with the aim of protecting pharmaceuticals, of increasing control over their distribution and utilization, and of



timely identification and curtailment of abuses and other violations of the law in the sphere of the public health system, to carry out the following measures jointly with the Directorate of Internal Affairs [UVD]:

- to discuss the situation regarding the pharmaceuticals supply of the population in the joint boards of directors (on-the-spot meetings) of the organs of the public health system and internal affairs; to develop, in the light of local conditions, specific measures directed toward the protection of medicinals and the observation of the principles of social justice with regard to their sale;
- to carry out systematically, with the involvement of the public, joint checks on the pharmaceutical and treatment-prophylactic institutions with regard to the subject of the holding back of pharmaceuticals from sale;
- to inform the USSR Ministry of Health within five days regarding all established cases of shortfalls, thefts, sales without invoice, and sales of goods of more than 2,000 rubles;
- to decide the question of official compliance on the part of directors of organs and institutions of the public health system who have permitted the indicated violations, when serious abuses, large shortfalls, squanderings, and thefts of material goods, and especially of medicinals are detected; to send all materials to the law enforcement organs quickly, in the time determined by the law, for careful investigation and for the calling of guilty parties to account;
- to seek out the possibility of the restoration of auditing services in all of the republican, kray, oblast, and municipal "Farmatsiya" production associations; to organize their operation in close contact with the organs of internal affairs and with the public;
- to permit the "Farmatsiya" production associations, with the agreement of local public health system organs, depending upon the situation regarding pharmaceuticals supply, to shorten the schedule of the sale of pharmaceuticals without a prescription; to work out the norms of sale of medicinals to the population, sold without a physician's prescription; to establish monitoring of their strict observation; as necessary, to temporarily expand the list of pharmaceuticals subject to quantitative-object accounting;
- to permit physicians of the treatment-prophylactic institutions, in case of necessity, to write prescriptions for pharmaceuticals for patients in in-patient treatment, with the obligatory reflection in the case record of data indicating that the pharmaceutical was obtained in a cash transaction.

In recent years serious problems have piled up in the pharmaceutical service; if these are not resolved the improvement of the quality of pharmaceutical service to the population will be impossible. One of the principal problems is the low prestige of the pharmacist's profession, which must be increased. The social defenselessness of pharmacy workers leads to a high turnover of personnel, to

a transfer of specialists to other sectors of the economy, and the impossibility of recruiting personnel for rural localities.

Problems relating to the improvement of the work and daily life of pharmacy workers and to the provision of living quarters for them have been poorly resolved. Pharmacy workers work at low wages. The weak materials and technological base of the service do not live up to contemporary requirements; the pharmaceutical institutions are deprived of necessary modern equipment, of minor mechanization facilities; hence the onerous conditions of work and social insecurity. The problem of turnover and the migration of young specialists has become aggravated in connection with the introduction of the new "Statute on the Job Assignment of Young Specialists and Their Utilization", regarding which the allocation to each young specialist of separate, well-furnished living quarters has been stipulated. Due to the lack of living space, many "Farmatsiya" production associations have turned down married couples in making job assignments. According to the data of January 1, 1990, there are 9,050 individuals on the list to obtain residential space; 11,029 individuals are living in dormitories, and 4,604 individuals are living in private apartments.

The supplying of pharmaceuticals in a large package to the pharmaceutical institutions is a serious problem. But, since minor mechanization is either insufficient or completely lacking in pharmacies, the women who work in the pharmacies are required to deal with bales of wadding weighing 50 kg, with cylinders of cathartics, oils and other liquids, including corrosives (perhydrol, ammonium hydroxide, etc.) weighing up to 25 kg, 20 kg barrels (potassium permanganate), and 40 kg sacks (boric acid), which substantially exceed the allowable load limits established for women. The repackaging of these medicinals must take place in the pharmacies. The USSR Ministry of Health has repeatedly turned to the USSR Ministry of Light Industry and other ministries and agencies; however, up to the present time, both the situation with regard to decreasing the packaging of the products of the USSR Ministry of the Chemical Industry, and with regard to increasing the amount of wadding supplied in unpacked form, have remained practically unchanged.

Among the pharmacies dealing with the servicing of the population and treatment institutions, more than 90 percent are pharmacies of the production type, by which, in addition to individual dispensing, about 400 million bottles of infusion solutions are made up. Therefore, it is necessary for the local "Farmatsiya" production associations to expand the network of pharmacies for the sale of prepared medicinal forms, while the preparing of pharmaceuticals for ex tempore prescription must be concentrated in the individual pharmacies which have at their disposal the conditions necessary for their preparation. The production of infusion solutions should also be centralized in inter-hospital pharmacies or in special production systems of the pharmacotherapeutic factories, which will increase the quality of their preparation to a substantial degree, and lead to the streamlined utilization of sterilization and other equipment.

The "Soyuzfarmatsiya" All-Union Corporation [V/O], affiliated with the USSR Ministry of Health, is undertaking a number of measures to improve the situation, and it is making efforts to obtain currency to acquire modern equipment for pharmacies and pharmaceutical factories, for the standardization of ex tempore prescriptions with the aim of transferring individually prepared pharmaceutical forms to industrial production.

The leave of pharmaceutical and auxiliary personnel has increased up to 24 working days by the Order of the USSR Ministry of Health of July 4, 1990. The payment in full of the pensions of pharmaceutical workers continuing to work after reaching pensioner age has been permitted.

In order to solve the problems of the restructuring of the national economy and the shift to a market economy, it is necessary to consider the problem of the wages of pharmacy workers, which at the present time is one-third lower than the average across the national economy, and to increase the pay of pharmaceutical workers by bringing it into conformity with the country-wide average.

A new conception is currently being worked out by the USSR Ministry of Health for the perfection of the salary system of workers in the public health institutions, in which the salaries of qualified pharmacists and [regular] pharmacists is established at the level of the corresponding categories of medical workers. An increase in wages of 78.5 percent on the average is envisaged in this conception.

Unlike other public health services, the pharmacy system carries out its activity based on cost-accounting principles. The "Farmatsiya" production associations of the Kazakh, Uzbek, and Tadzhik Republics and a number of the territories of the RSFSR were transferred in 1989 to operation under the new management conditions. It is planned to complete the transfer of the pharmacy service to the new management methods in 1990.

However, the present system of price-setting does not permit the receipt of revenues in amounts which ensure the reimbursement of material losses, the creation of normal working conditions, the development of the materials and technical base of the pharmacy system in accordance with technical norms requirements, or the solution of social welfare problems of pharmacy workers.

When determining retail prices for pharmaceuticals, the magnitude of the established permissible mark-ups allows for a level of gross impositions in the range of 21-23 percent, given distribution costs in recent years of 23-26 percent on the average.

A uniform maximum mark-up on wholesale prices from 1 kopeck to 100 rubles and higher per pack, given equal expenditures for selling, leads to the presence of preparations which are "profitable" and "unprofitable" for sale.

The preparation of pharmaceuticals in pharmacies, the "wholesale" ex-factory price which includes only the cost of the medicinals and glassware involved, while the remaining expenses (wages, the maintenance of fixed capital, payment for ancillary materials, distilled water, etc.),

amounting to about 400 million rubles are assigned to the pharmacies' distribution costs, is an entirely loss-making proposition.

The principal direction in the price policy for medications was the assurance of the accessibility of pharmaceuticals to all strata of the population; therefore, the retail prices for medications have been sustained at a constant level, or have been decreased periodically when wholesale prices have gone up. At the present time, revenues from the sale of 44.9 percent of the listed pharmaceutical items do not make up for the expenditures in relation to their sale; 9.6 percent have a retail price lower than the wholesale price; the total loss of the pharmacy system relating to their sale is more than 300 million rubles per year.

This is manifested acutely in relation to medicinal plant raw materials, where, due to the non-correspondence which has developed between the purchase, wholesale, and retail prices, 86 (33.7 percent) of 255 medicinal plants utilized in treatment do not achieve the planned level of profitability when they are sold; 106 (41.6 percent) have retail prices lower than wholesale. The annual loss, in light of expenditures for processing them, is 20 million rubles per year, given a sale volume of 34 million rubles.

These inadequacies in the price-setting system have led to the fact that, as the sales of medicinals and other medical products increased in retail prices by 80.1 percent from 1979-1989, income in the pharmacy system decreased by 77.9 percent and profitability from 10.4 to 3.1 percent.

At the same time, the level of profitability of the "Farmatsiya" production associations fluctuated sharply. About thirty associations in the RSFSR and the Ukrainian and Kazakh Republics were plan loss-makers.

In connection with the fact that the current system of price-setting does not permit the assurance of the formation of economic stimulation funds in sufficient amounts to guarantee the normal operation of the pharmacy system, which negatively affects the pharmacy service to the population, the USSR Ministry of Health and the "Soyuzfarmatsiya" All-Union Corporation affiliated with the USSR Ministry of Health, after repeated pleas to government organs, received the permission of the USSR State Committee on Prices [Goskomtsen] for the sale of pharmaceuticals made up and packaged in pharmacies associated with treatment-prophylactic institutions based on prices agreed upon with the executive committees of the local counsels, and ensuring the cost-accounting activity of the pharmacies. In addition, permission was also obtained to sell prior to January 1, 1991 medicinal plant raw materials (and preparations made from them), made up by the "Soyuzfarmatsiya" All-Union Cooperation affiliated with the USSR Ministry of Health, at prices established by the regional "Farmatsiya" associations. At the present time there is agreement with the USSR State Committee on Prices regarding the possibility of extending this procedure to 1991 as well.

The USSR State Planning Committee [Gosplan], the USSR Ministry of Finance [Minfin], and the USSR State Committee on Prices, to which the proposals for the

improvement of price setting were addressed, are supporting them, and believe that they can be implemented within the framework of measures for the improvement of the entire system of price-setting in the national economy.

In the course of the price reform which lies ahead, it has been proposed to transfer some pharmaceuticals and other *materia medica* to sale on the basis of agreed wholesale and retail prices. However, the majority of them will be sold on the basis of retail prices prevailing today, but will be acquired from suppliers on the basis of new wholesale prices. Such a disproportion in prices will entail a sharp increase in the loss margin of the pharmacy system. Therefore, the possibility of the allocation of a state subsidy to cover the losses of the pharmacy system from resources of the national budget is being concurrently considered on the basis of fixed subsidy rates, differentiated by regions.

In light of the fact that the USSR Ministry of the Medical Industry is not completely satisfying the demand for any of the groups of domestically produced preparations, the USSR Ministry of Health was compelled, on the basis of the opinions of scientific centers and WHO recommendations, to define 447 necessary preparations, the full supply of which will permit the carrying out of pharmacotherapy in the light of contemporary requirements of medical science. The list has been sent to the USSR State Committee on Planning for incorporation in the discharge of the government's demand, with the aim of production and delivery to the public health system.

The USSR Ministry of Health has repeatedly proposed to the USSR Ministry of the Medical Industry that it explore the question of the production of the most important pharmaceuticals at the full volume of the demand of the public health system through an increase in production capacities and a decrease in the production of less effective preparations; however, the situation has changed slowly, and is under the constant monitoring of the "Soyuzfarmatsiya" All-Union Corporation of the USSR Ministry of Health.

With the same ends in view, the USSR Ministry of Health has recently activated efforts to exclude from the schedule of outmoded, ineffective pharmaceuticals for which there is no demand. In 1989 through July 1990, 167 preparations were excluded. Proposals for the exclusion of another 326 preparations are under review.

Requirements relating to the quality of pharmaceuticals produced increased in 1989-1990; the production of seven forms of insulins, which correspond to domestic scientific-technical advances [NTD], but which are not up to world standards with respect to the degree of purity and other indices, was terminated.

Starting in 1987, the USSR Ministry of Health changed the approach to the formulation of the demand for pharmaceuticals and *materia medica*. The demand of the USSR Ministry of Health is oriented to the true requirement of the public health system for pharmaceuticals in light of the advances of world pharmaceutical science, and not to the capacities of the domestic industry, as was the case earlier.

A decision was taken conjointly with the USSR Ministry of the Medical Industry regarding the introduction by the republics of adjustments in the schedule of products and in the volumes of applications for pharmaceuticals, which will offer the possibility to take into account the changes occurring in the conjuncture of demand for medicinals and in the proposed volumes of their production and deliveries, and of correcting errors which have been committed. Such adjustments were undertaken four times in 1989, and twice in the first half of 1990.

In light of the grave situation which has developed in relation to pharmaceutical supplies, the Council of Ministers of the USSR, based on proposals of the deputies of the Supreme Soviet of the USSR, has allocated an additional 500 million rubles for the purchase of pharmaceuticals abroad in 1989.

In order to ensure the rational utilization of the allocated currency appropriations, a large study was conducted with regard to the selection for purchase of the pharmaceuticals which are most important and necessary to the public health system.

A decision was taken at a joint meeting of the management of the USSR Ministry of Health and the USSR Ministry of the Medical Industry to target additional appropriations for the purchase, in the first place, of vitally important preparations of various pharmacotherapeutic groups (antibiotics, x-ray contrast media, antitumor and cardiovascular agents, muscle relaxants, etc.), as well as of substances for the production of medicinals which will permit the achievement of significant savings of currency resources.

The schedule and the volume of purchases of contemporary preparations used in world medical practice were determined by the All-Union Scientific Center for Surgery of the USSR Academy of Medical Sciences [VNTsKh AMN SSSR], the A. V. Vishnevskiy Institute of Surgery, the Scientific Research Institute of Pediatrics of the USSR Academy of Medical Sciences, the All-Union Scientific Center for Antibiotics of the USSR Academy of Medical Sciences, the All-Union Scientific Center for Hematology of the USSR Academy of Medical Sciences, the Acad. N. N. Petrov Scientific Research Institute of Oncology, the I. M. Sechenov Moscow Medical Academy, the Scientific Research Institute of Tuberculosis, the All-Union Scientific Research Center [VNITs] for the Protection of Maternal and Child Health, the All-Union Scientific Research Institute [VNII] for Transplantology and Artificial Organs of the USSR Ministry of Health, the All-Union Oncological Scientific Center [VONTs] of the USSR Academy of Medical Sciences, the All-Union Endocrinological Scientific Center of the USSR Academy of Medical Sciences, et al.

An order for the purchase of pharmaceuticals was worked out on the basis of data obtained by the USSR Ministry of Health and the USSR Ministry of the Medical Industry. The filling of the order was stipulated to completely satisfy the need of the public health system with respect to a

number of pharmacotherapeutic groups, such as antidiabetic, oncological, antituberculosis, and diagnostic preparations, and to satisfy the need for others at the 70-95 percent level.

The requisition was drawn up in light of the annual requirement and the creation of a carry-over stock, since in this period prospects for the supply for 1990 were lacking. In addition, the closure of domestic production systems was planned with respect to a number of positions.

However, not all foreign firms were ready to produce preparations in the required amounts in short periods of time due to a lack of raw material and production capacity. In a number of cases contracts were not signed due to disagreements over commercial questions. In this context, the schedule was adjusted in view of the possibility of the purchase of analogs (sporidex, a synonym of the domestically produced cephalixin; thiamazole for percazoly [perkazolil]; nephramine, an amino acid nutriment, analogous to levamine [levamin]; farluta, an analog of domestically produced hydroxyprogesterone, which was recommended for purchase by the the All-Union Oncological Scientific Center of the USSR Academy of Medical Sciences, etc.). Purchases which had been supplied to the USSR previously and had been removed later due to limitation on appropriations (trasylol, a synonym of contrical and gordox) were renewed in light of the recommendations of specialists.

Preparations which do not have analogs among the domestically produced preparations and which are the only means of treatment of certain diseases (virolex, a unique pharmaceutical used in any of the types of herpes, etc.) were purchased for the first time. At the present time there are requests from the republics for an additional allocation of virolex. The purchase of the preparations was carried out with an orientation toward the maximally complete supply within a pharmacotherapeutic group, taking interchangeability into account. In all 302 listed pharmaceutical items (on account of an additional 500 million rubles), including 51 new pharmaceuticals, were purchased; of these, there were 39 synonyms of domestically produced or purchased imported preparations, and 12 entirely new medications.

All the preparations were purchased by the "Medeksport" All-Union Corporation at current world prices.

In a number of cases the price of new preparations was somewhat higher than the price of the domestic analogs due to a difference in doses. However, in light of their greater effectiveness, and consequently the lower cost of the preparation per treatment course, and the decrease in the duration of the treatment course, as well as in view of expenses associated with the patient's hospital stay and his pretreatment on an ambulatory basis, the economic efficiency of the new preparations was equal to, and sometimes even higher than, the available analogs or synonyms.

For example, the cost of the treatment of one sepsis patient with theuropenia by the new antibiotic fortum (Great Britain) is 6 rubles 24 kopecks per day on the average (dose, 90 mg of the preparation per 1 kg of the patient's

weight) as against 13 rubles 32 kopecks for comprehensive therapy using tobramycin (60 mg/kg) and azlocillin (150 mg/kg); the treatment of sepsis with fortum in one oncological patient costs 48 rubles per day (4 g of the preparation) as against 57 rubles 60 kopecks per day when the complex of carbenicillin (30 g) and brulamycin (240 mg) is used.

The cost of one pack of keflex (500 capsules, USA) is 122 rubles 50 kopecks. Its synonym, the domestically produced cefalexin, is produced in the same dosage, 30 capsules per package, at a cost of 7 rubles 37 kopecks per package. Thus, the cost of one capsule of the same preparation is identical, and amounts to 24.5 kopecks.

The efficacy of the antiviral preparation, virolex (Yugoslavia), is much greater in the herpetic infections than the domestically produced chylepin [khilepin] and other anti-herpetic agents: the period of remission is increased almost 3-fold, and the therapeutic effect is observed as early as the first days of treatment with virolex.

The massive delivery of medications began in November 1989 and continued over the course of the first half of 1990. In connection with this, preparations in amounts based on annual demand were delivered in a short period to warehouses and depots. This period coincided with the planned delivery of medications against 1990 funds. As a result the sale of some remedies (fosfomycin, which was bought in service of the indebtedness of Syria to the USSR) slowed down, since new, more contemporary, and in certain cases, less expensive preparations appeared. Thus, the antibiotic fosfomycin (ampules) began to arrive in the country in 1988. In the first half of 1989, under conditions of an acute shortage of pharmaceuticals, it was possible to accomplish its purchase in the form of capsules and syrup, the formulation for children, which are almost not produced at all by the domestic industry. Its deliveries were tied in with the acquisition in the form of a no-payment, in-kind discount on blood transfusion systems for adults and children, only one-third of the need for which was filled by the domestic industry.

The acute situation in the supply of oncological, antituberculosis, psychotropic, and antidiabetic preparation was ameliorated as the result of additional purchases by the end of 1989.

The problem of supplies of muscle relaxants, antibiotics, and x-ray contrast media has been completely solved.

In connection with the extremely limited period for the realization of export purchases of medications for additionally allocated currency appropriations of 500 million rubles, there was no possibility of circulating timely information regarding preparations which were being supplied for the first time.

When the question of the schedule of pharmaceuticals subject to supplementary purchase was resolved, the results of an analysis of letters and personal appeals of citizens sent to the "Soyuzfarmatsiya" All-Union Corporation affiliated with the USSR Ministry of Health were taken into account along with other factors. Additional



purchases of medications abroad made it possible to alleviate the acuteness of the situation as early as the fourth quarter of 1989: the number of letters decreased by 21 percent in the fourth quarter as compared with the first quarter. The number of letters which arrived in the first half of 1990 also decreased by 22.4 percent as compared with the same period of 1989. In the process the number of letters regarding the lack of cardiovascular, hormonal, and psychotropic preparations, as well as of such pharmaceuticals in short supply as cerebrolysin, solcoseryl, trental, raveron, rumalon, and voltaren decreased by a factor of 2 and more. While the total number decreased, the relative proportion of epistolary appeals regarding domestically produced preparations (cathartics, analgesics, theophedrine [teofedrin], etc.) increased from 29 percent in the first half of 1989 to 35 percent in the first half of 1990.

Despite the difficulties with pharmaceutical supplies, the USSR Ministry of Health took measures in 1986-1990 to significantly improve the supply to regions which had suffered from the Chernobyl NPS (Nuclear Power Station) [AES] accident. Thus, the resources of the Kiev oblast "Farmatsiya" association increased in this period from 23.5 million to 46 million rubles; of the Zhitomir association, from 19.2 to 36.14 million rubles; of the Chernigov association, from 16.96 to 31.3 million rubles; of the Rovno association, from 12.6 to 21.9 million rubles.

In June-August 1990, specialists of the USSR Ministry of Health and the "Soyuzfarmatsiya" All-Union Corporation affiliated with the USSR Ministry of Health studied the state of supply to the strict control regions through on-site visits. The check demonstrated that the principle of the primary and maximal allocation of pharmaceuticals to the afflicted regions was being observed in all oblasts.

In order to completely satisfy the requirements of these population centers in 1990, funds of the RSFSR and the Ukrainian and Belorussian Republics to a total of 7.1 million rubles have been additionally allocated for specific purposes (analgesics, polyvitamins, antihistaminics, plasma substituent solutions, blood transfusion systems, surgical gloves, decontamination agents [dez-sredstva]).

However, overall, the pharmaceutical situation in the country remains critical.

The way out of this situation in the upcoming years is seen in the maintenance of the links which have been developed, i. e., of the centralized system of pharmaceutical supply.

In addition, it is urgently necessary to reach a decision regarding the unimpeded currency financing of all accounts for medical products purchased abroad during the current year.

It is also necessary to include in the State Requisition (State Order [Goszakaz]) for pharmaceuticals in 1991 95-100 percent of the volumes produced per specific schedule.

The USSR Ministry of the Medical Industry and other industrial ministries and departments, manufacturers of medical products, must rapidly deliver funds to the USSR Ministry of Health for pharmaceuticals and materia medica for 1991, and assure the urgent conclusion by industrial enterprises of industrial agreements for deliveries of these products to public health institutions through the established links.

It is required, in order to fully satisfy the requirements for pharmaceuticals in 1991, to allocate 5 billion rubles in currency to the public health system for the purchase of not only prepared pharmaceuticals, but also substances, semi-products, technologies, and equipment which will permit the development of our own base for their production without decreasing the volume of pharmaceuticals to be purchased.

It would be advisable to free the pharmacy system as well as enterprises manufacturing medical products, and raw and other materials necessary for its production, from taxation for a period of not less than three years, and to provide without limitation concessions and top priority credits for the development of the domestic pharmacotherapeutic industry.

It is necessary, stipulating the recruitment for these purposes of the currency resources of the enterprises and organizations and the assets of the local Soviets, to create in the republics, oblasts, and krais in the shortest time possible small production systems for the manufacture of solutions and other pharmaceuticals, including the simplest preparations and materia medica, with broad-based use of local resources.

In the context of the fact that, according to the available forecasts, the level of satisfaction of the public health system's requirements for pharmaceuticals in 1991 is anticipated to be even worse than in the present year, it is necessary to mobilize the entire organizational and professional capacities of pharmacy workers for the neutralization of the crisis state with regard to pharmaceuticals through the maximum intensification of the available local production systems and the enhancement of responsibility on the part of specialists for each segment of the work; it is necessary to proceed more boldly to the creation and development of joint enterprises, with the recruitment of the capital of other countries for the equipping and development of our own pharmacotherapeutic industry.



**Cytogenetic and Clinical and Hematological Indices in Individuals**

917C0637 Kiev VRACHEBNOYE DELO in Russian  
No 1, Jan 91 (manuscript received 5 May 90) pp 32-34

[Article by L. P. Kindzelskiy, E. A. Demina, L. L. Zlochevskaya, Kiev Scientific Research Institute of Oncology]

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[Text] Ascertaining the radiation dose received by each individual when masses of people are in a zone of radioactive contamination presents considerable difficulties as a result of the lack of reliable dosimeters and the uneven irradiation of the body, including irradiation of the blood and bone marrow. Also of significance is the amount of time between the beginning of the irradiation and when tests are performed. The radiobiological basis of the indication of radiation damage involving nonstochastic effects at various levels of biological objects is the level of cytogenetic changes, which is regarded as a biological dosimeter, which has been confirmed in practice.<sup>1</sup> Changes of bioindicators and clinical manifestations of radiation damage to humans have been compared in the context of hematological indices.<sup>2</sup>

In 60 individuals irradiated during the cleanup at the Chernobyl Nuclear Electric Power Plant, we determined the individual dose received by the body from cytogenetic changes of blood lymphocytes in the context of a comparison with cellular indices of the blood, cell integrity and morphological composition of bone marrow, and degree of clinical manifestations of radiation sickness (or radiation reactions).

We established the diagnosis (degree of acute radiation sickness, or ARS) on the basis of the primary clinical symptoms (nausea, vomiting, headache, fever, damage to the skin and mucosae, etc.) that appeared after irradiation; on the basis of curves of variation of the number of leukocytes, lymphocytes, and granulocytes over the first month; on the basis of cell integrity of sternal punctates of bone marrow, myelograms, and percentage of the content of destroyed forms of cells produced in the first week, until the end of the first month; and on the basis of an assessment of those indices at the end of treatment.

We made the cytogenetic assessment of absorbed dose of radiation with metaphase analysis and chromosome aberrations in a culture of lymphocytes of peripheral blood. We cultivated the lymphocytes for 52 hours in medium 199, which contained PHA (Bacto, U.S.). We determined the percentage of aberrant cells, the total number of chromosome aberrations, and the aberrations of the chromatid and chromosome types (single and paired fragments, chromatid exchanges, dicentric and other polycentric, centric and acentric rings, atypical chromosomes). The physical values of the absorbed doses for those patients were determined from the cytogenetic data obtained, dose calculation tables, and the calibration curves described by A. V. Sevankayev and A. P. Nasonov.<sup>3</sup> For each patient, we analyzed an average of 200-300 metaphases. The tests were done after various periods of time in the postirradiation

period: 20, 30, and 40 days from the moment of irradiation to the taking of blood for cytogenetic tests.

Certain patterns were found in the analysis of the damage to the cytogenetic apparatus of blood lymphocytes in the irradiated individuals. The magnitude of absorbed dose, estimated from the chromosome test, was lower than that that could have been responsible for the severity of the course of the illness and the degree of hematological changes in each patient, which can be explained by a number of factors. After being admitted to the clinic, all the patients underwent massive detoxification therapy, including measures aimed at, for example, the disincorporation of radionuclides and the sanitation of radiation injuries to the skin and mucosae (the latter including the digestive tract), and the elimination of nuclear decay products. Depending on the indications, we used blood preparations, blood substitutes, complexones, and, among other things, transplants of allogenic bone marrow selected on the basis of the HLA system. Before the cytogenetic testing, most of the patients exhibited elevated levels of the absolute number of blood lymphocytes, and when the time between irradiation and testing grew longer, the difference between the initial levels and those observed at testing grew by factors of 2 or 3 or more.

As time elapsed after irradiation, peripheral blood levels of irradiated lymphocytes bearing potential radiation-induced changes of the chromosome apparatus decreased. That is due, first, to the fact that lymphocytes containing radiation-induced aberrations are gradually eliminated from the pool of peripheral blood lymphocytes as a result of cell replacement. Second, the replacement cells in the pool of peripheral cells come primarily from normal cell-precursors. Consequently, as time passed after the radiation exposure, new, undamaged cells "diluted" the pool of lymphocytes, on the one hand, and cells with lethal aberrations were eliminated, on the other. That resulted in a decrease in the percentage of aberrant cells and the total number of chromosome aberrations. In addition, the use of fresh donor blood, leukocyte mass, and bone marrow played an important part in increasing the population of undamaged lymphocytes.

In analogous stages of radiation sickness, the level of damage to the genetic apparatus and the estimated doses to the body diminished as the time between irradiation and testing increased. We observed two patients who were admitted to the clinic 25-45 days after irradiation and who did not receive adequate therapy in the latent period of their illness; cytogenetic testing, however, was done after hospitalization. Both patients exhibited changes in the quantitative composition of the blood and bone marrow. Pronounced local radiation injuries were observed, primarily to the lower extremities, and they were assessed as second-degree radiation burns, with third-degree area exposure. Because treatment geared toward detoxification and elimination of radionuclides was not performed before admission to the clinic, the percentage of aberrant cells was rather high, especially in one of the patients, in whom the degree of radiation injury was judged to be first-degree acute radiation sickness, as determined from the total

clinical picture and the bone-marrow cell integrity (bone marrow syndrome). In both patients, the damage to the genetic apparatus was more pronounced. In a comparison of their indices with those of the other patients, the level of cytogenetic damage was 3- to 4-fold higher in the two patients in more serious condition. Even the dose, which was determined clinically from the first-degree bone-marrow syndrome of the illness and the local radiation injuries, could be estimated at 200 rem or more. At the same time, those in a similar stage of the illness, but who had been treated sooner after irradiation, exhibited indices in that period that corresponded to 20-50 rem. The patients in the clinic received enterosorbents, and they underwent numerous evacuations of the digestive canal contents, hemosorption, and hemodilution with forced diuresis. Their diets included cellulose, vitamin complexes, and calcium-, sodium-, potassium-, and phosphorus-enriched components. Transfusions of leukocyte-mass and thrombocyte-mass blood were ordered, and patient P. received an HLA-allogenic marrow transplant.

Hematological indices for patient Sh. indicated a pronounced drop in cellular blood and marrow indices. Between 8 May 1986 and 22 May 1986, the number of myelocaryocytes dropped from  $77,500 \times 10^9/l$  to  $4,400 \times 10^9/l$ , and the level of chromosome aberrations increased over a three-day period to 36 per 100 cells examined from 25 per 100, even though the patient had had no further exposure to irradiation. One can assume that the additional damage occurred as a result of incorporated radionuclides.

Thus, as the time gap between irradiation and cytogenetic testing grows, the level of aberrant cells and the total number of chromosome restructurings drops. Adequate therapy during the latent period of the illness helps to lower the potential dose load on the body, which was confirmed by the decrease in the amount of chromosome changes in the lymphocytes of the patients. Based on the dynamics of clinical symptoms and hematological indices, the potential degree of development of ARS diminishes in the period of its manifestation. If active pathogenetic treatment is not performed in the latent period of ARS, genetic changes in the cells remain at the same level, and ARS symptoms during the period of manifestation are more pronounced.

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#### Some Results of Radioecological Investigations in Kiev Following the Chernobyl Accident

917C0676A Kiev *GEOLOGICHESKIY ZHURNAL*, in Russian No 2, Mar-Apr 91 (manuscript received 29 Jan 90) pp 43-49

[Article by V. A. Kryuchenko, Ministry [M-vo] of Geology of the USSR, Kiev]

UDC 504.75.05

[Text] Questions regarding the conduct and the principal results of a complex of radioecological investigations, carried out in Kiev in the period 1986-1990, are reviewed; these included: regular gamma- and beta-survey at points of the reference grid, vehicle-borne gamma spectrometric survey along city streets, a detailed gamma-survey on a 1:2,000 scale, and radiochemical sampling of the soils of the entire territory of Kiev.

The "Kirovgeologiya" geological production association of the Ministry of Geology [Mingeo] carried out many different investigations in the period 1986-1990 in connection with the Chernobyl NPS accident, to assess the radiation situation on territories subjected to radioactive contamination. This relates first and foremost to radioecological investigations of Kiev as a large urban industrial complex located in relative proximity to the zone of the CNPS. The main lines of these investigations within its limits at that period was the carrying out of radiomonitoring and a detailed radiometric and radiochemical study of the degree of contamination of the entire territory of the city.

The accomplishment of the first objective was achieved through the regular conduct of a complex of a gamma- and beta-survey along a grid of constant reference points, numbering at first about 600; in June 1986 these were increased to 970, which corresponds to a survey on a scale of 1:50,000. The measurement of the gamma radiation exposure dose rate (EDR [MED]) and the beta particle fluence rate were carried out using radiometers with gas-filled counter tubes (of the Prognoz type) on the soil surface (at a level of 5-10 cm), and sometimes of the gamma radiation EDR at an altitude of about 1 m. The frequency of the measurements was 1-2 per month in 1986, and in 1987-1990, 2-3 times per year. In all, 22 observation cycles were carried out from May 1986 to the end of 1990; this included 13 cycles from 1986. Typically two maps were constructed on the basis of the measurements: the gamma radiation exposure dose rate and the beta particle fluence rate in the soil.

Uneven contamination of the city with radionuclide fallout was established right from the first surveys. The central portion of the city, adjacent to the right bank of the Dnepr, was the most contaminated, where the intensity of the gamma radiation in the soil at the end of May 1986 was from 200 to 400  $\mu R/h$ , and reached 500-600  $\mu R/h$  at

specific local anomalies (Podolskiy, Rayanskiy, and Zaliznychnyy rayons). A lesser degree of contamination (100-200  $\mu\text{R/h}$ ) was recorded in the western and southwestern portions of the city (Leningradskiy and Zhovtnevyi rayons), as well as in the northern portion of the Dneprovskiy rayon.

Fluctuations in the beta particle fluence rate in the soil on contaminated surfaces (on soil, asphalt, etc.) were even more sharply expressed than the gamma radiation exposure dose rate, but overall a quite close correlation was observed between the spatial location of the areas of contamination between the two types of radiation. As was the case in relation to the intensity of the gamma radiation, the lowest beta particle fluence rate (500-1,500  $\beta\text{-particles/cm}^2 \times \text{min}$ ) was observed in the western and southwestern portions of the city. The closer to the center of the city, the more the beta particle fluence rate (up to 2,000-5,500  $\beta\text{-particles/cm}^2 \times \text{min}$ ) increased, reaching magnitudes of the order of 3,000  $\beta\text{-particles/cm}^2 \times \text{min}$  here and there (especially along the right bank of the Dnepr).

In addition to their use in the construction of the maps, the data of the measurements of gamma and beta activity were subjected to statistical analysis on a computer in order to determine, in particular, the average values of the gamma radiation exposure dose rate and the beta particle fluence rate for individual rayons and for the city as a whole. The results of the radiomonitoring throughout Kiev for the period May 1986 through July 1990 are shown in the generalized form in Fig. 1, from which it can be seen that the average value throughout the city of the gamma radiation EDR in the soil fell approximately from 400  $\mu\text{R/h}$  at the end of May 1986 to 14-16  $\mu\text{R/h}$  in July 1990, while the beta particle fluence rate went respectively from

2,000 to 3-4  $\beta\text{-particles/cm}^2 \times \text{min}$ , which are practically the normal background values.

It became clear, even at the initial stages of the radioecological investigations in Kiev, that the rate observations on the reference grid (with an average density of 3-4 points per 1  $\text{km}^2$ ) were representative only for the assessment of the general radiation situation in the city and of the character of its change in time, but were clearly insufficient for the study of the real distribution of the radionuclide fallout on the city's territory. Taking this into account, the detailed radiometric examination of the entire open urban territory (about 320  $\text{km}^2$ ), which included the carrying out of an advance vehicle-borne gamma spectrometric survey on a 1:10,000 scale and a gamma-survey on foot on a 1:2,000 scale. A vehicle-borne gamma spectrometric survey was carried out along streets and courtyards, with a route density of 10-12 km per 1  $\text{km}^2$ . The survey was carried out by "Neva" stations, the gamma spectrometer of which has a scintillation detector measuring 200 x 100 mm.

The on-foot gamma-survey on a 1:2,000 scale is performed using SRP-68-01 radiometers by continuous monitoring along a contour, and by the taking of recorded measurements along a 20 x 10 m grid. The survey data were accumulated in an initial data bank, and were subjected to statistical analysis on a computer, as a result of which the background gamma radiation for a given period, and correspondingly the lower limit of anomalies (LLA [NPA] =  $Me + 3\sigma$ , where  $Me$  is the median, and  $\sigma$ , the standard deviation), which decreased perceptibly during the period following the accident, was determined. Thus, in 1986 the LLA was 95  $\mu\text{R/h}$ , 80 in 1987, 70 in 1988, 60 in 1989, and in 1990 about 50  $\mu\text{R/h}$ . Using a dataplotter, maps were constructed on the basis of these data of the gamma field

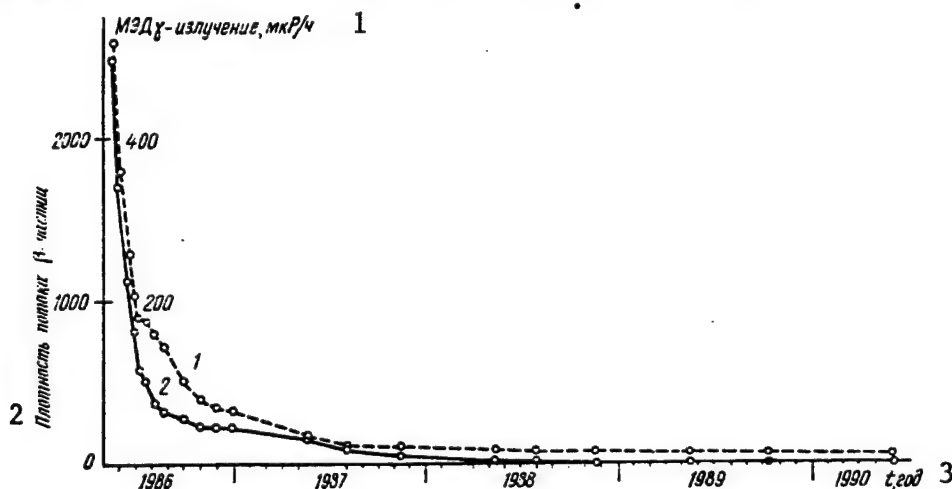


Fig. 1. Change in the gamma radiation exposure dose rate (1) and the beta particle fluence rate (2) in Kiev for the period May 1986-June 1990.

Key: 1.  $\gamma$  radiation EDR,  $\mu\text{R/h}$ —2.  $\beta$  particle fluence rate—3.  $t$ , year

on a 1:2,000 - 1:5,000 scale, with a set gamma radiation EDR isoline interval and a precise referencing of the anomalies detected.

The vehicle-borne gamma spectrometric survey (4856 km) has by now been carried out completely in Kiev, and the on-foot gamma survey on a 1:2,000 scale, by means of which about 300 km<sup>2</sup> of accessible urban territory has been photographed, is practically complete. This comprised an enormous volume of radiometric observations (more than 1.5 million measurements), which made it possible to objectively and reliably assess the radiation situation in the entire territory of the city; to distinguish, on the basis of the data of dosimetric measurements at the area's anomalies, underlying deactivations in accordance with the existing contamination control levels; and to carry out a complex of studies in a significant portion of them to determine the nature of the identified anomalies, to outline them in plane, to determine the burial of radionuclides for the purpose of assessing the scope of deactivation operations, etc.

One of the important results of the large-scale radiometric surveys was the establishment of the extremely uneven character of the radioactive contamination of the city's territory. This was governed by the initial "spotty" radionuclide fallout, as well as by their secondary redistribution as the result of natural vertical and horizontal migration and by the influence of other factors. Thus, according to the data of gamma-ray logging of a large number of bore holes to a depth of 50-60 cm, sunk in anomalous areas under various conditions, it was established that the maximum activity of the radionuclides in undisturbed soils in 1986-1987 was confined to the upper layer (0-3 cm), whereas in 1989-1990 it had shifted to a depth of 5-7 cm, while in disturbed soils and permeated (porous) soils, it has shifted even more substantially (down to 15-20 cm), as other investigations had noted\*. This last, in particular, can be observed in the example of the Dnepr beach, which is shown in Fig. 2. A fragment of a map of the gamma field along the southern portion of Trukhanov Island, composed on the basis of the results of a survey on a 1:2,000 scale of the condition in the middle of 1988, is presented in it as an illustration. It is readily seen that the beach strip (the southwestern part of the island) from the footbridge on the north (beyond the borders of the fragment) to the southern extremity of the island is clean; the intensity of the gamma radiation here on the surface of the majority of the sandy beaches is about 20  $\mu\text{R/h}$  (rarely rising to 30  $\mu\text{R/h}$ ) using the SRP-68-01 scintillation radiometer, which corresponds to 15-25  $\mu\text{R/h}$  using dosimeters with gas-filled counter tubes, and is the normal background for Kiev. At the same time, in addition to clean areas (20-30  $\mu\text{R/h}$ ) on both shores of the island's Matveyevskiy Inlet, areas with increased gamma radiation EDR values (up to 40-50  $\mu\text{R/h}$ ) are distinguished, as well as local anomalies with an intensity of 100-200  $\mu\text{R/h}$  in the epicenter, depending upon the composition of the soils of the shoreline strip, its degree of weed infestation, etc.

With regard to the secondary redistribution of radionuclides, within the city limits it can be seen that the majority

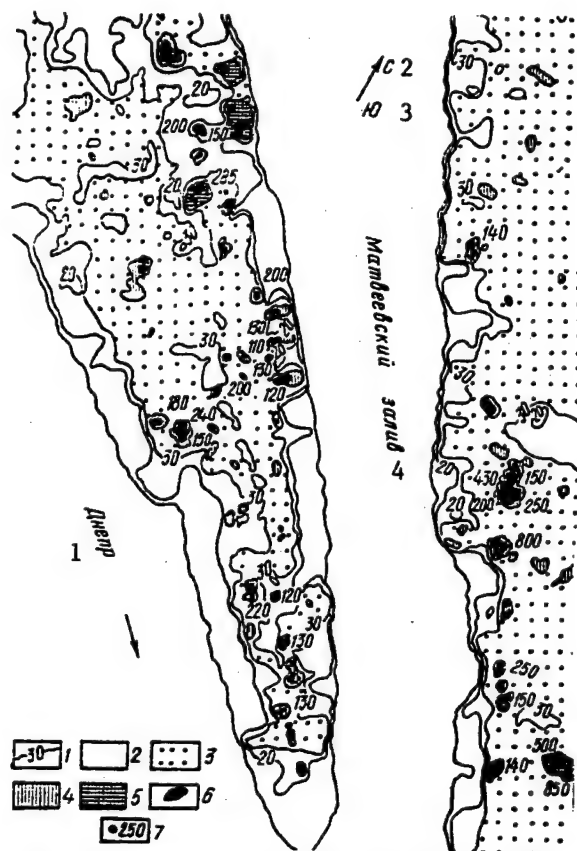


Fig. 2. Character of the gamma field of the southern portion of Trukhanov Island, based on the results of a radiometric foot survey on a 1:2,000 scale. 1 - isolines of gamma radiation in the soil the SRP-68-01 radiometer, in  $\mu\text{R/h}$ ; EDR: 2- up to 30  $\mu\text{R/h}$ ; 3- from 30 to 50  $\mu\text{R/h}$ ; 4- from 50 to 70  $\mu\text{R/h}$ ; 5- from 70 to 100  $\mu\text{R/h}$ ; 6- greater than 100  $\mu\text{R/h}$ ; 7- maximal value of EDR at the epicenter of anomalies in  $\mu\text{R/h}$ .

Key: 1. Dnepr—2. N—3. S—4. Matveyevskiy Inlet

of anomalies are clearly confined to elements of the urban and natural milieu. They are most often located in the soil under downspouts, at dips along the path of rain runoff, sewage grates, around trees in asphalted zones, etc. The anomalies are characterized by a diversity of forms and dimensions and by a wide range of intensities. They are close to isometric in the majority of cases, sometimes somewhat elongated (frequently along downspouts from roofs). Here and there along the shoreline zones of bodies of waters, narrow (width 3-5 m) linear anomalies, extending hundreds of meters, are observed. The sizes of the anomalies range within wide limits: from point anomalies (less than 1.0 m<sup>2</sup>) to relatively large areas (100 m<sup>2</sup>). As the result of the analysis of an enormous amount of actual data on Kiev, the following distribution of anomalies with respect to area sizes was established (along the 120  $\mu\text{R/h}$  contour using the SRP-68-01): point anomalies (up to 1.0



m<sup>2</sup> in area) make up 29 percent of their total number; area anomalies measuring from 1.0 to 10 m<sup>2</sup>, 52 percent; from 10 to 100 m<sup>2</sup>, 16 percent; and greater than 100 m<sup>2</sup>, 3 percent. Anomalies with respect to the gamma radiation exposure dose rate (measured by SRP-68-01 radiometer at soil level) are distributed in the following manner: anomalies with an epicenter intensity up to 120  $\mu$ R/h make up 83 percent of their total number; at an EDR from 120 to 300  $\mu$ R/h, 15 percent; from 300 to 1,000  $\mu$ R/h, 1.7 percent; and greater than 1,000  $\mu$ R/h, 0.3 percent.

It must be emphasized, the hygienically significant anomalies which are subject to deactivation, based on the control levels of radioactive contamination existing at the present time (established by the municipal epidemiological station [gorSES]), are those which are characterized by a gamma radiation exposure dose rate greater than 65  $\mu$ R/h using the DRG-01T dosimeters (which correspond approximately to 120  $\mu$ R/h using the SRP-68-01 radiometer), and by a definite area manifestation; taking this into account, about 15 percent of all the identified anomalous increases within the Kiev city limits are accounted for by such anomalies.

In all these years the detailed radiometric surveys were accompanied by radiogeochemical soil sampling, the volume of which increased with time. Thus, one of the first assessments of density of the contamination of the city with both isotopes of cesium (137 and 134), about 2.0 Ci/km<sup>2</sup> on the average (with a range of 0.3 to 5.0 Ci/km<sup>2</sup>), was made on the basis of the results of the sampling of 60 points as early as August 1986.

At the present time the most complete and careful radiogeochemical examination of Kiev is the detailed and homogeneous sampling of all the accessible territory of the city carried out in July-August 1990. Eight hundred and ninety-eight soil samples along all the points of the reference radiomonitoring grid were selected. The samples were recovered by means of a standard sampler following the technique of the State Committee for Hydrometeorology [Goskomgidpromet]; a sampling depth of 20 cm was chosen, with due account taken of the above-mentioned burial of radionuclides; this assured a practically complete withdrawal of the accumulation of radionuclides in the sample. A control batch of 37 samples was taken in addition to the main samples for the assessment of the natural dispersion of radionuclides in the soil, and an internal and external control of the laboratory analyses was carried out. The main analyses to determine the activity of gamma emitting isotopes was carried out in the "Kirovgeologiya" laboratory (using AM-A 0.3F1-3 analyzers), and the external control (32 samples) and the determination of strontium 90 were carried out in the laboratory of the Republic Scientific Hygiene Center of the UkSSR Ministry of Health [Minzdrav USSR]. According to the data of the external control, there was no systematic discrepancy between these laboratories, and the root-mean-square random error was  $\pm 0.9 \times 10^{-9}$  Ci/kg. The percentage root-mean-square error was  $\pm 19$  percent, which is within the limits of the permissible error.

The gamma radiation activity was determined in all the samples recovered, as a result of which it was established that in the overwhelming majority of the samples (about 85-90 percent), the specific activity of cerium 144, cesium 134, and ruthenium 106 was lower than the threshold sensitivity of the equipment employed ( $1.0 \times 10^{-9}$  Ci/kg). In the same samples in which substantial activity values were established, it varies within the following limits: from 0.15 Ci/km<sup>2</sup> (the lower threshold of sensitivity) to 3.1 Ci/km<sup>2</sup> for cerium; to 2.3 Ci/km<sup>2</sup> for ruthenium and to 1.2 Ci/km<sup>2</sup> for cesium 134, respectively. With regard to the principal gamma emitter (cesium 137), the number of samples with substantial activity values reaches 80 percent. The activity of this isotope varies within the limits of 0.2 to 8.9 Ci/km<sup>2</sup>; at the same time, the overwhelming majority of the samples (about 73 percent) have an activity up to 1.0 Ci/km<sup>2</sup>. There were 96 samples (10.7 percent) with an activity greater than 2.0 Ci/km<sup>2</sup>, including those with an activity greater than 3.0 Ci/km<sup>2</sup>, 27 samples (3.0 percent), and those with an activity greater than 5.0 Ci/km<sup>2</sup>, only 10 samples (1.1 percent). The average density of the contamination of the territory of Kiev with cesium 137, based on the condition extant in July-August 1990 was 0.6 Ci/km<sup>2</sup> (median), and the total density of the contamination with all gamma emitters can be estimated at approximately 0.1 Ci/km<sup>2</sup>.

The character of the distribution of cesium 137 throughout the city's area is presented in Fig. 3. As was the case in relation to the data of the detailed radiometric surveys, the cleanest parts of the city are the western and southwestern parts, where the contamination density is less than 0.5 Ci/km<sup>2</sup> on the average. The contamination density increases to 1.0 Ci/km<sup>2</sup> on the average in the center of the city and on the left bank as well.

The data obtained suggest an exceptionally complex and uneven distribution of cesium 137 on the city's territory, which can be seen both in the diagram itself (Fig. 3) and from the results of the statistical analysis of the sampling data: the standard deviation is 0.6 Ci/km<sup>2</sup>, and the coefficient of variation reaches 79 percent. Moreover, this is indicated by the comparison of the results of the analysis of the principal and the control sampling as well: relatively insignificant shifts in the points of the recovery of samples lead to substantial disparities in the concentrations determined; if laboratory error is excluded, the natural variation of the dispersion of cesium 137 reaches 37 percent (about 0.5 Ci/km<sup>2</sup>). Consequently, in this case even the use of a rather dense sampling grid (3-4 points per 1 km<sup>2</sup>) still does not guarantee the obtaining of a map of radionuclide distribution in the soil with the desired detail, and provides only an approximate representation of their behavior. This question merits a more detailed analysis of the available data of the radiometric and radiogeochemical surveys, and may be considered separately. At this point it is only necessary to emphasize that if only laboratory errors are taken into account, then the isoline interval of 0.5 Ci/km<sup>2</sup> of the surface activity of cesium 137 on the diagram of its distribution (Fig. 3) is admissible. However, when the natural variation of the nuclide is taken into account, which is more legitimate, an isoline interval of at



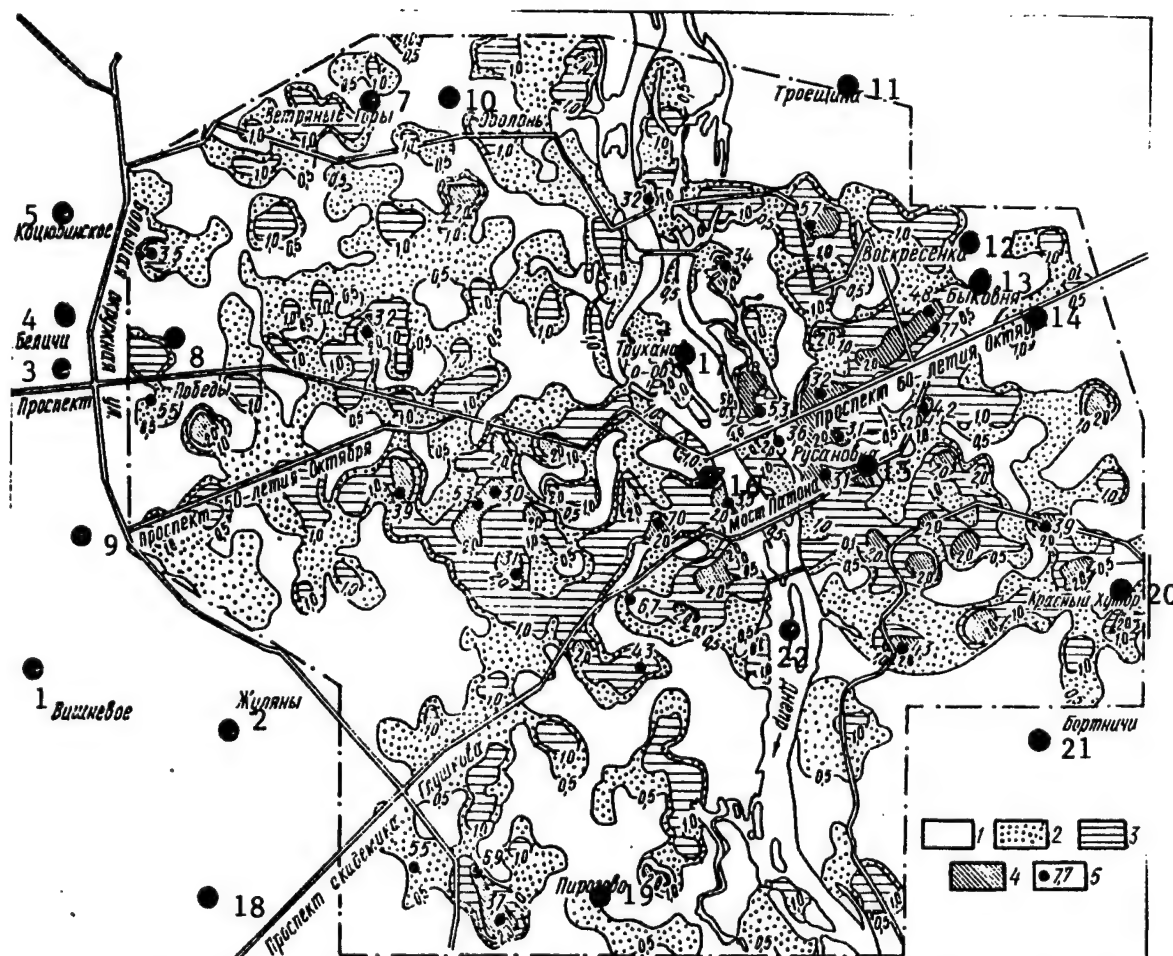


Fig. 3. Map of the density of the contamination of Kiev with cesium 137, based on the results of the sampling of 898 points in July-August 1990. The surface activity of cesium 137 (contamination density in  $\text{Ci}/\text{km}^2$ ): 1—up to 0.5; 2— from 0.5 to 1.0; 3— from 1.0 to 2.0; 4— from 2.0 to 3.0; 5— values of cesium 137 activity at particular points exceeding  $3.0 \text{ Ci}/\text{km}^2$ .

Key: 1. Vishchnevoe—2. Zhulyany—3. Prospekt—4. Belichi—5. Katsyubinskoye—6. Bolshaya okruzhnaya ul.—7. Vetryanyye Gory—8. Pobedy—9. Prospekt 50-letiya Oktyabrya—10. Obolon—11. Troyeshchina—12. Voskresenka—13. Bykovnya—14. Prospekt 60-letiya Oktyabrya—15. Rusanovka—16. Most Patona—17. Trukhanov Island—18. Prospekt akademika Glushkova—19. Pirogovo—20. Krasnyy Khutor—21. Bortnichi—22. Dnepr

least  $1.0 \text{ Ci}/\text{km}^2$  should be accepted. Therefore, the selection of an isoline of  $0.5 \text{ Ci}/\text{km}^2$ , which undoubtedly has considerable hygienic significance, is arbitrary to some degree. According to the available data, it would be more correct to regard the entire range from 0.1 to  $1.0 \text{ Ci}/\text{km}^2$  as a unitary region with respect to contamination density.

The analysis of the character of the change in the ratio of the concentrations of the four principal radionuclides in the soil of Kiev over the time period since the accident, which is shown in generalized form in Fig. 4, is also of interest. The actual graphs shown in Fig. 4 of the change in the contribution of gamma emitters to their total activity represent, in essence, integral relationships which are

governed by the radioactive decay of the isotopes and as well as by other factors (the varied capacity of the radionuclides to convert to mobile forms, their varied capacity to migrate, etc.). As can be seen, the contribution of cesium 134 remained practically unchanged during those years (7-8 percent), the contribution of ruthenium 106 changed insignificantly (from 18 to 10 percent), whereas the proportion of cerium 144 fell 18-20 percent (by a factor of 3), and the proportion of cesium 137 increased by a factor of 5-6, and now is 64-65 percent on the average across Kiev. When we extrapolate the experimental relationships obtained, it can be predicted that among the gamma emitters the principal contribution to the radiation burden of Kiev by the end of 1992 will be made by cesium 137

(90-95 percent), with an insignificant proportion of cesium 134 and ruthenium 106. The density of contamination by all radionuclides has by now practically stabilized, and will be maintained in the future for a substantial period of time throughout the city at a level of 0.5-0.6 Ci/km<sup>2</sup>.

It should be noted that analyses of a significant proportion of the samples recovered in 1990, including of some representing the greatest interest, for strontium 90 and for plutonium 239 will also be concluded in the near future in the Republican Scientific Hygienic Center [RNGTs]; after this it may be possible to give a relatively complete characterization of the contamination of Kiev by all of the Chernobyl radionuclides.

#### Footnotes

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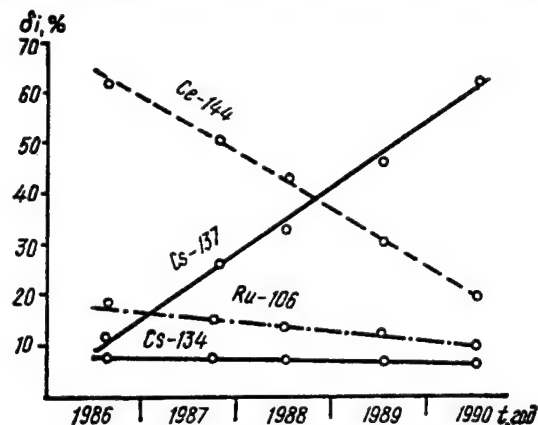


Fig. 4. The dynamics of the change in the ratio of the contribution of the principal radionuclides (gamma emitters) to their total activity throughout Kiev for the period August 1986-August 1990.

Key: 1. t, year

**Culture of Cells From Lung Tissue of Transgenic Rabbit—Growth Hormone Producer for Cattle**

917C0447 Moscow DOKLADY VSESOYUZNOY  
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[Article by M. I. Musiyenko, A. V. Makarevich, Academy of Agricultural Sciences Academician L. K. Ernst, I. L. Goldman, L. P. Dyakonov, N. S. Strelchenko, V. A. Semenova, O. K. Smirnov (deceased), and V. A. Matveyev, All-Union Scientific Research Institute of Experimental Veterinary imeni Ya. R. Kovalenko; All-Union Scientific Research Institute of Animal Husbandry; All-Union Scientific Research Institute of Farm Animal Physiology, Biochemistry, and Nutrition]

UDC 575.113:57.089.67

[Abstract] In studying the possibility of producing cultures of somatic cells of a transgenic rabbit for the production of beef somatotropin, the researchers microinjected into a male pronucleus a cloned chromosomal beef somatotropin gene (*b GH*) isolated in the form of a fragment that included part of the 5'-transcribed region without a cap site and the 3'-untranscribed region with a termination site, in the vector structure *pMTBGHchr*, which contains the MT1 mouse metallothioneine gene promoter and enhancer. Transgenicity was confirmed by screening the DNA of the cells of various organs and tissues after treatment with restrictases *Pst* I, *Pvu* II, *Bam* HI, *Kru* I, *Eco*R I, and *Bgl* II. Foreign DNA was integrated into the genome without restructuring, in tandem, in 5-10 copies. Lung tissue of an eight-month-old rabbit was deaggregated. The cells were further reseeded in a ratio of 1:1 to 1:2. Production of beef somatotropin was determined with radioimmune techniques. The maximum level of somatotropin in the culture medium was 7 ng/mg. Five subsequent passes were made in 40 days. Figures 1; references 11: 8 Russian, 3 Western.

# Hissar Virus: A New Virus of the Bunyaviridae Family Isolated From *Argas Vulgaris* Fil. Ticks in Tajikistan

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PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI  
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[Article by Z. Ye. Gordeyeva, M. A. Kostyukov, A. U. Kuyma, O. A. Daniyarov, V. P. Bulychev, N. V. Nemova, T. M. Skvortsova, D. K. Lvov, and Yu. P. Kadoshnikov, Tajik Institute of Epidemiology and Hygiene, Dushanbe]

UDC 578.833.1:576.895.421].083.12

[Text] A virus classified as belonging to the Bunyaviridae family was isolated from *Argas vulgaris* ticks as a result of comprehensive studies of arboviruses circulating in Tajik SSR.

**Material and methods.** A total of 80 specimens of *Argas vulgaris* ticks were collected in August 1982 in a room of one of the administrative buildings in Dushanbe, and they were divided into four samples of 20 specimens. The virus was isolated in one- to two-day-old white mice by intracerebral and subcutaneous infection with 0.02 ml suspension. Animals were under observation for two weeks.

The virus was identified using the complement fixation reaction (CFR) with ascitic fluid immune to all arboviruses existing in the reference bank of the Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences.

Electron microscopy with an EM-100B microscope was used to identify the strain family. A monolayer of infected and control cells from a swine embryo kidney (SEK) culture was removed from the slide mechanically, and centrifuged for 10 min at 1500 rpm. The obtained sediment was filtered with 2.5 percent glutaraldehyde solution and 1 percent OsO<sub>4</sub>. Dehydration, saturation and embedding in araldite were carried out by the conventional techniques. Ultrafine sections were cut with an LKB ultratome and stained with 5 percent uranylacetate solution in 70 percent methanol and lead citrate.

**Results and discussion.** As a result of virological studies of *Ar. vulgaris*, two specimens of antigenically related viruses were isolated. The viruses were named after the site of their primary detection in the Hissar Valley.

After initial infection, the incubation period lasted 12 days, and it decreased to five days in the third passage. The strain underwent seven passages. After intracerebral infection, infectivity titer of the pathogen constituted 5.6 log LD<sub>50</sub>/0.02 ml for newborn white mice.

The virus is sensitive to ether. After treatment with the latter, viral titer decreased to 2 log LD<sub>50</sub>/0.02 ml. The virus does not agglutinate goose erythrocytes.

Suckling mice are sensitive to Hissar virus after intracerebral infection. The clinical signs are convulsions, paralysis of the extremities, and death. The other animals (adult white mice, albino rats, guinea pigs, rabbits, birds—

turtledove, pigeon) developed complement-fixing and precipitation antibodies when infected with this virus.

Pathogenicity of Hissar virus for man is unknown, but a study of the immunological structure of the population (from 17 different rayons of this republic), antibodies were demonstrated in titers of 1:8-1:64 in 2.6 percent of those tested.

Upon identification of a strain of Hissar virus by electron microscopy, we detected viral particles ranging in diameter from 50 to 100 nm. In most cases, the particles were situated in the intercellular spaces. They had a membrane 10-12 nm in width, consisting of 2 osmophilic and 1 osmiophobic layers. The viral particles had the morphological and morphogenetic properties inherent in representatives of the Bunyaviridae family (see Figure).

No analogues were demonstrable among representatives of the Bunyaviridae family upon serological identification of the virus in the CFR, whereas the antigen was functional in a titer of 1:256-1:512 in homologous serum (see Table).

## List of ascitic fluids immune to representatives of Bunyaviridae family used for identification of Hissar virus (Tajik strain No 5595) in CFR

Genus	Antigen group	Ascitic fluid immune to viruses
Bunyavirus	Bunyamwera	Bunyamwera, Batai, Kairi
	California	California, Tahyna, Inkoo
	Simbu	Simbu, Akabane
	Bwamba	Bwamba
	Capim	Bush-bush
	Tete	Tete, Bahig
	Guama	Mahogany Hammock
	Patois	Patois
	Bakau	Bakau
Phlebovirus	Ungrouped	Kaeng-Khoi
	Phlebotomus fever	Neapolitan fever
		Sicilian fever
Neurovirus	Ungrouped	Rift Valley fever, Zinga
	Crimean hemorrhagic fever	CHF, Hazara, Khasan
	Ungrouped	Nairobi sheep disease virus, Dugbe
Uukuvirus	Uukuniemi	Uukuniemi
Unclassified representatives of Bunyaviridae family		Kaisodi, Bakau, Bhanja, Lone Star, Tamdy, Razdan, Artashat, Kaspiy

Thus, the data obtained by virological and serological methods, as well as electron microscopy, enable us to conclude that the strain of Hissar virus isolated from *Argas vulgaris* Fil. ticks is a new virus of the Bunyaviridae family.



Virions in a culture of cells infected with Hissar virus. Magnification 90,000x

The fact that a new virus has been isolated from *Ar. vulgaris* (widespread in Central Asia) [1, 4], which is a parasite of synanthropic birds often found in residential and administrative buildings, and is capable of attacking man [2, 3, 5], is of definite epidemiological importance, since it is indicative of the possibility of existence of arboviral infection sites in the immediate vicinity of man.

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